ENGINEERING • INSTALLATION • MAINTENANCE

electrical contracting

Industrial Electrification SECTION

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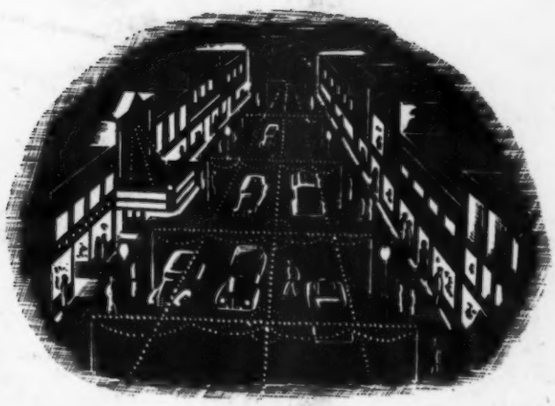


DECEMBER • 1940

See How Easy It Is to Install This G-E TIME SWITCH

Type T-44 generai-purpose time switch — an easy and profitable addition to your window-wiring jobs

IT'S just a matter of minutes—installing this modern, general-purpose time switch. Everything has been done to make the wiring job as easy, simple, and fast as possible—because that means less installation cost, and more profit for you.

Telechron Motor and Sturdy Construction Save Call-backs

Once you have installed a Type T-44 time switch you won't have to worry about service call-backs eating up your profits. The well-known Telechron motor and sturdy, simple construction mean long, dependable service and accurate timing.

The switch is housed in an attractive, drawn-steel, electrogalvanized and lacquered case suitable for either indoor or outdoor installation.

Get This Easy, Extra Profit

The season for modernizing and renovating show-window and sign lighting systems is just beginning. It's easy to add this G-E time switch to the wiring contract and get the extra profit. The nearest General Electric Supply Corporation store can tell you all about it—or ask your own supply house for more information. If you prefer, write General Electric Company, Schenectady, New York, and ask for Bulletin GEA-1427. It will give you complete information about Type T-44—information that may help you get some profitable, extra business.

GENERAL ELECTRIC

THE HANGING of GREAT AUNT MATHILDA

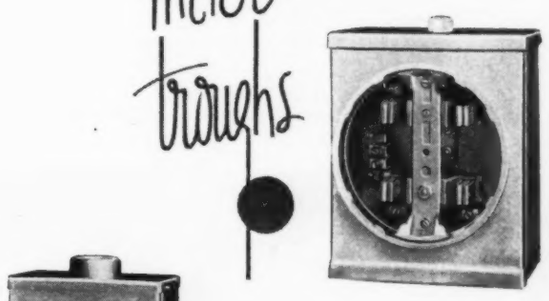
NO EASIER THAN HANGING

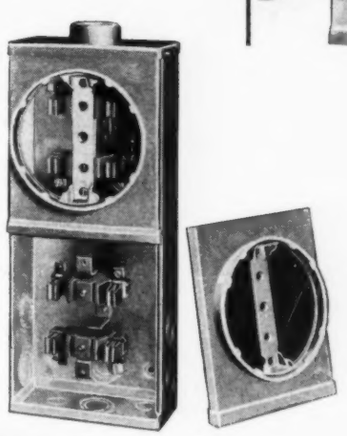
Murray meter troughs

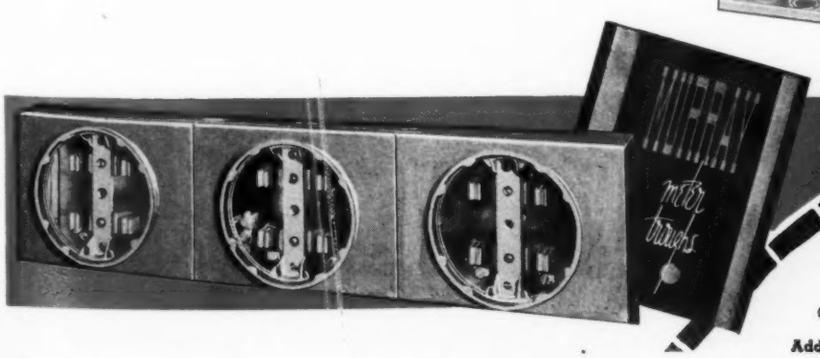
quick as a wink
simple as ABC

If it weren't a matter of business, we'd wager that many a contractor with a sense of humor would hang these Murray Troughs in spare time, just for the fun of it. Man—they ARE easy to hang—and quick, too!

Outdoor and indoor types in singles, doubles and in units of three, all of which can be connected to make a trough ten miles long, if you have room for it. Be modern. Save effort. Take the headaches out of installation. Hang Murray Troughs. Metropolitan Device Corporation, Brooklyn, N. Y.







METROPOLITAN DEVICE CORPORATION
Brooklyn, N. Y.

Gentlemen: Please send me—free of cost or obligation—my copy of "Murray Meter Troughs."

Name _____ Title _____

Company _____

Address _____

Why you'll be

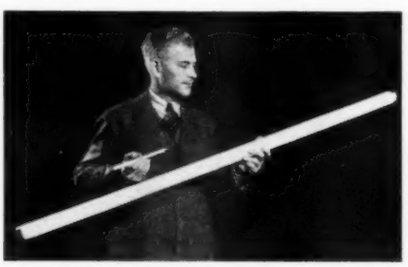
ILLUSTRATION COPYRIGHTED 1940, ESQUIRE - CORONET INC.

RACK UPON RACK, G-E MAZDA *F lamps burn day and night in General Electric's Laboratory. These life tests help assure the increasingly high standards set by G-E Research.*

IN THIS INSPECTION, *one of many tests, the girl is checking the overall length, accuracy of base pins, and strength of bases of* G-E MAZDA *F lamps.*

THIS MACHINE *tests the brightness of the fluorescent powders used in* G-E MAZDA F *lamps . . . an important factor in making these lamps stay brighter longer.*

HERE *a skilled laboratory technician places a 100 watt* G-E MAZDA F *lamp in an 80-inch spherical photometer—a giant "electric eye" that measures light output.*



FROM THE TINY 6 WATT TO THE GIANT 100 WATT *there's a complete line of* G-E MAZDA F *lamps.*

G-E MAZDA "F" LAMPS *are recommended for use only with equipment providing good power factor, such as Fleur-O-Liers or RLM Industrial fixtures. The label shown here identifies Fleur-O-Lier fixtures, made by over 35 experienced manufacturers.*

out in front

...when you sell

G-E FLUORESCENT LIGHTING

YOU'LL have a five-way lead on competition when you use the help G.E. gives you for selling Fluorescent Lighting. Business is searching for new ways to meet today's problems. Factories need more light to speed production. Stores need more light to stop and attract customers. And G-E Fluorescent lighting, with its cool tubes of indoor daylight, is just what the doctor ordered! Read what follows, and see why G-E Fluorescent lighting is *easier to sell.*

1. SELL CERTIFIED FIXTURES

Sell and recommend certified fluorescent fixtures—Fleur-O-Lier or RLM. Styled to suit your customers' needs, they assure maximum fixture performance because they are certified by Electrical Testing Laboratories to comply with exacting specifications.

This certification may be obtained by any manufacturer whose product meets the specifications. A wide choice of fixtures is available, because General Electric cooperates impartially with *many* fixture manufacturers and does not make fixtures itself. This wide choice helps you keep out in front when you sell these fixtures fitted with G-E MAZDA "F" lamps.

2. SELL ENGINEERED LIGHTING

It's no trick to sell fluorescent lighting. The important thing is to sell the right kind of light, properly engineered to the job. Experienced lighting engineers, averaging 16 years service with General Electric, are available at each of G.E.'s strategically located sales offices for help and advice on G-E Fluorescent lighting.

3. SELL THE LAMP WITH CONSUMER PREFERENCE

Sell the brand for which 40 years of G-E advertising has created a consumer preference. Today G-E advertising is creating more and more customers for G-E MAZDA "F" lamps . . . to make them easier for you to sell. Millions of messages in *Saturday Evening Post, Collier's, Time, Business Week, Newsweek, Nation's Business,* and many other publications are reaching your important industrial and commercial customers.

4. SELL INCREASED LIGHT—LOWER PRICES

MAZDA research has again accomplished the seemingly impossible. In 2½ years, G-E MAZDA "F" (Fluorescent) lamps have been improved, light output generously increased, yet prices today are lower even than a year ago! And there's a complete line of G-E MAZDA F lamps—from the tiny 6 watt size to the big 5 foot 100 watt lamp. In range of sizes and colors (five, plus daylight, white, and soft white) G.E. offers just what your customers need!

5. USE THESE ADDITIONAL SALES HELPS

Use the wealth of training material, sales helps, and direct mail pieces that G.E. has prepared for you. For example, G.E. has developed especially for distributor sales organizations, an educational program that supplies lighting salesmen with necessary technical information on typical applications of fluorescent lighting and practical suggestions for selling it. In addition, several series of direct mailing pieces are available for you to send to stores, factories, offices, and other business prospects.

FOR COMPLETE INFORMATION, see your nearest General Electric Lamp Sales Office, or write to General Electric Company, Dept. 166-EC-L, Nela Park, Cleveland, Ohio.

G-E MAZDA LAMPS

GENERAL ELECTRIC

4 CHOICES

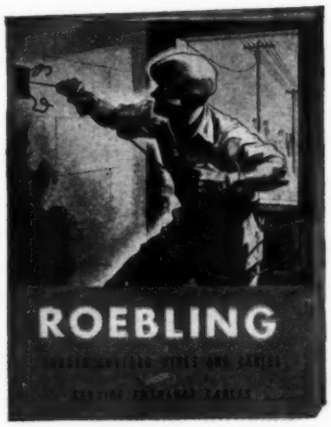
New Roebling Catalog gives further details for specifying and installing larger capacity feeders—adequate branch circuits

"Thin-Wall" broke the bottleneck of inadequate wiring—by making more wattage available through existing conduit. But the Underwriters Standards for this new Building Wire are detailed and complex...and you must know your Code before any particular wire can be specified.

Although all these wires have a maximum operating voltage of 600 volts, the basic characteristics vary with the insulation. With the exception of SN, these wires have a fibrous covering that is moisture-resistant and flame-retardant.

And there are many more factors—such as Number and Size of Conductors in a Conduit, Current-carrying Capacities under various installation conditions—that must be determined before work can proceed. That is where the Roebling Catalog, shown, can help you. If you haven't received your copy, be sure to write for it now.

JOHN A. ROEBLING'S SONS COMPANY
Trenton, N.J. Branches in Principal Cities



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ROEBLING SMALL DIAMETER BUILDING WIRE

electrical contracting

With which is consolidated The Electragist and Electrical Record
Established 1901

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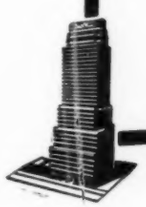

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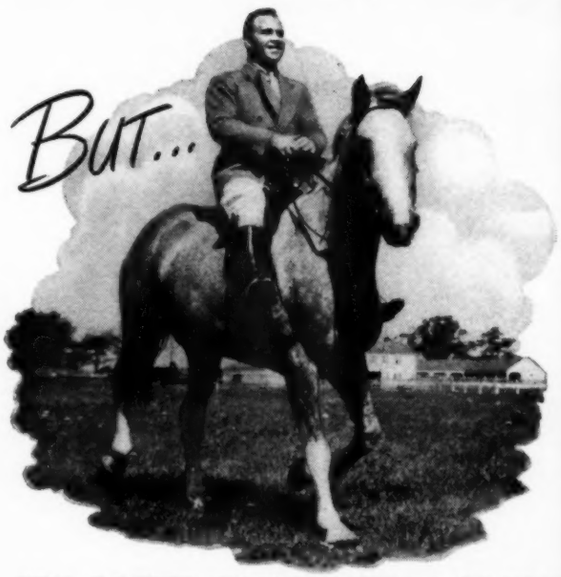
A SERVICE PAPER for electrical contractors, engineers, motor shops, industrial electricians and inspectors, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction—industrial, commercial, and residential.

You can ride BAREBACK



IT'S EASIER GOING WITH A SADDLE

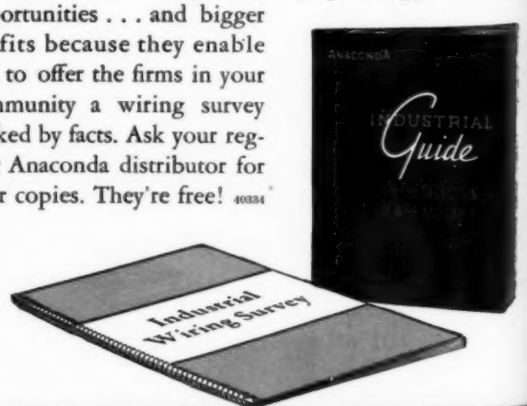
•

Smooth out the Ups and Downs in Your Business!

It's a lot easier to build new business . . . steadier and bigger electrical profits when you *use* those two handy, helpful little sales stimulators Anaconda has prepared especially for you.

They're called the "Industrial Wiring Survey" and the "Industrial Wiring Guide." Right now they're more valuable to you than ever. Why? Because today—according to authorities—nine out of ten industrial plants are in need of new wiring. Old, worn out circuits, overloading and failure to provide adequately for new equipment mean wasted money and possible electrical failure. What's more, most plant supervisors aren't aware of these conditions.

That's where you—the Survey and the Guide come in. The Survey enables you to make a step-by-step check-up of industrial circuits; the Guide to correct the conditions found. Together they spell bigger wiring opportunities . . . and bigger profits because they enable you to offer the firms in your community a wiring survey backed by facts. Ask your regular Anaconda distributor for your copies. They're free! 40334



ODERN IMPROVED

Anaconda Wire & Cable

IRE & CABLE COMPANY, General Offices: 25 Broadway, New York City; Chicago Office: 20 North Wacker Drive

Subsidiary of Anaconda Copper Mining Company. Sales Offices in Principal Cities

electrical contracting

DECEMBER, 1940

God or King?

YOU'LL REMEMBER in Shakespeare's play "King Henry VIII," Cardinal Wolsey, virtual ruler of the realm, lost the King's favor and fell from power. "Had I but served my God," he said, "with half the zeal I served my King, He would not have left me naked to mine enemies."

THE QUOTATION COMES TO MIND, because I have been thinking of the plight of distribution in our industry. For, like the Cardinal, the wholesalers seem to have misplaced the allegiance of their service and come upon troubled times. And all of us are troubled with them.

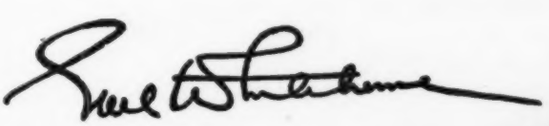
IN THE BEGINNING IT WAS VERY SIMPLE AND PLAIN. A jobber assembled locally the products of many manufacturers. He served the local buyers by offering them this selection of products, guiding their choice. His function was clear cut. He held to it.

THEN THE INDUSTRY BOOMED. The number of manufacturers multiplied by jumps. Everybody wanted active agents to push their lines. Selling became more intensive. Jobbers began "representing" a string of manufacturers rather than offering customers a "selection." More than 200 of the stronger wholesale houses in the country are now in manufacturer-owned chains.

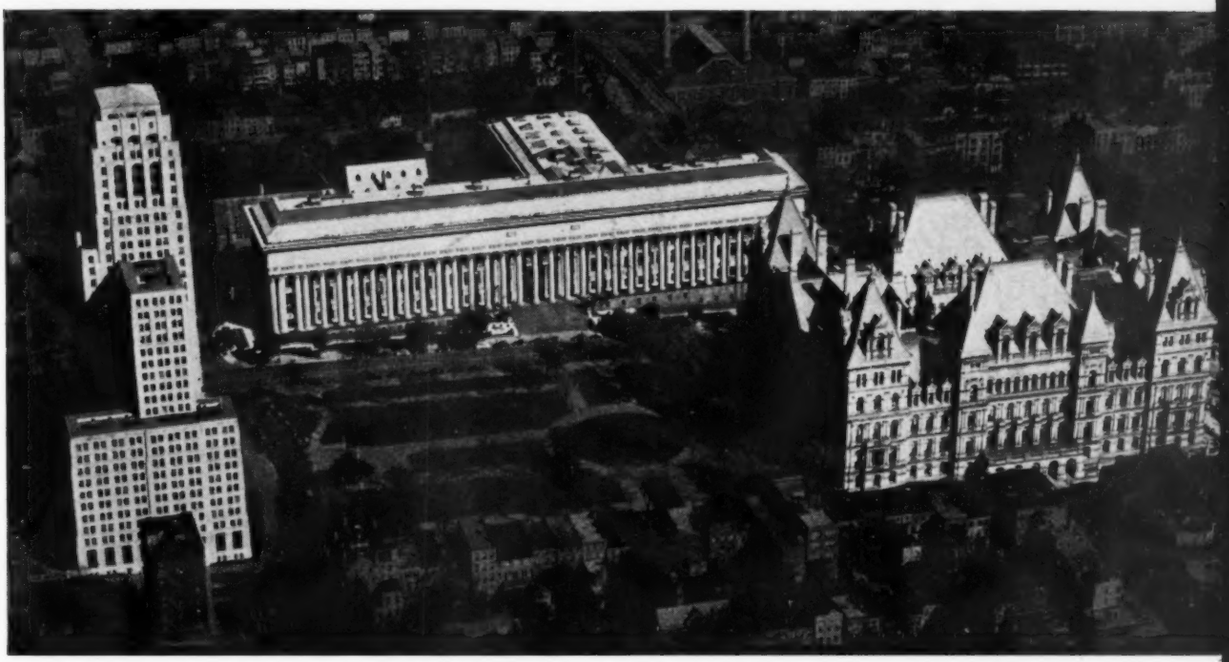
AND WHAT HAPPENS? Fluorescent equipment gives a good current example. The chains serve a few manufacturers only. Independent houses serve a few more, city by city. What do the many other manufacturers do? What would you do? They seek and setup other agents, distributors, half-jobbers, to get outlets for their lines. And these, feeling no responsibility for order in our distribution, make their own rules for the day's expediency.

BUT UNDERSTAND—I DO NOT CONDEMN THE CHAINS. They have made valuable contributions to progress—through better management, efficiency, economies, higher standards, leadership in market development. And we all benefit. But our wholesalers appear to have carried the intensive specialized selling too far and run foul of a vital principle. And it is not too late, I believe, for them to ponder it.

TO PARAPHRASE CARDINAL WOLSEY, they might state the case this way—"If I had served my customers (by giving them a wider selection of competing products) as I have served my owner or exclusive manufacturer (by giving him specialized national distribution) I would not now stand naked to my competitors, (that I have bred by barring other manufacturers from this market place)." Perhaps some compromise of function is possible.



MODERNIZING a State Capitol



The electrical system of the New York State Capitol buildings has been changed over from direct to alternating current. Also modern equipment replaces obsolete wiring and a network distribution is used

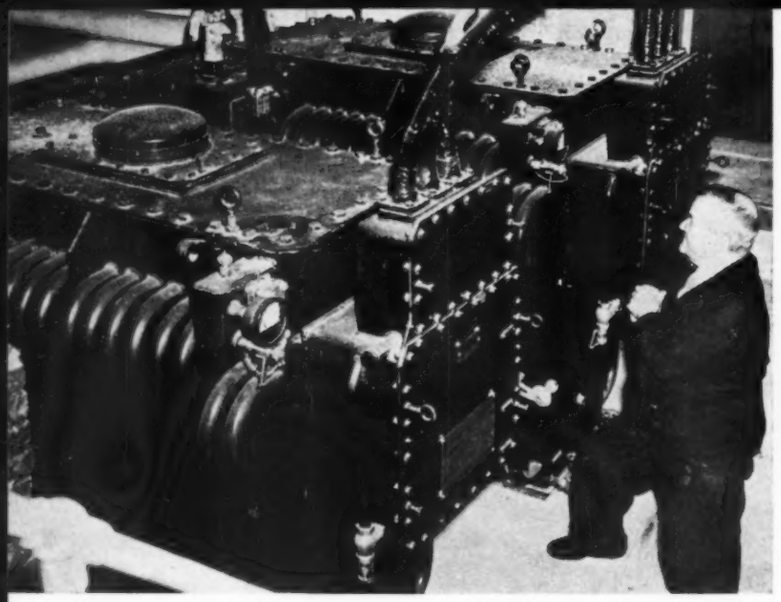
By Edward Vanderlinde
Vanderlinde Electric Corp.
Rochester, N. Y.

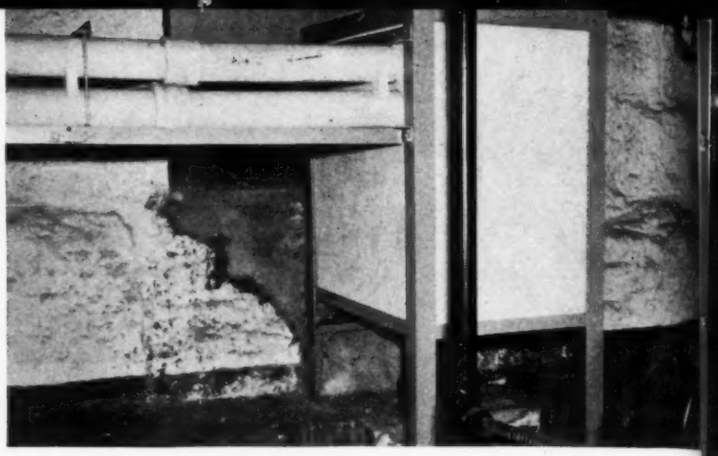
FOR more than a score of years, the State of New York has generated its own direct current power for the various state buildings centered in Albany. However, the state engineers felt that the generators and other plant equipment in the power house had reached the end of their practical usefulness and decided, in the future, to purchase electric power from the New York Power and Light Corporation, a division of the Niagara-Hudson Corporation. Such a change required that all the electrical equipment in the buildings previously supplied from the State's power house be changed from direct to alternating current.

The Vanderlinde Electric Corporation, electrical contractors of Rochester, N. Y., was awarded the contract for the changeover of three buildings, the State Capitol, Court of Appeals and the Power House. This included the changing of some 250 pieces of equipment ranging in size from 1/40-hp. sewing machines to 80-hp. fire pumps, a section of new switchboard in the Capitol building and the installation of a network distribution system unique in state projects. The state electrical engineer, O. R. Dickinson, collaborated with the General Electric Company and power company engineers in evolving this network system to provide insurance against service breakdowns which would retard the activities of more than two thousand employees.

The network system consists of four service points with several tie-ins for the purpose of isolation and feedback in case of failure of one of the services. The Capitol and Education buildings have one primary service each, while the Office building has two services, one in normal use and the other a standby. Each of these four sources of supply is connected to buses in the power company's generating plant. The tie-in of the system centers in the Capitol building where the network transformers, grids and protectors are located.

In reality, the Capitol building has three sources of supply. The accompanying diagram on page 11 shows vault

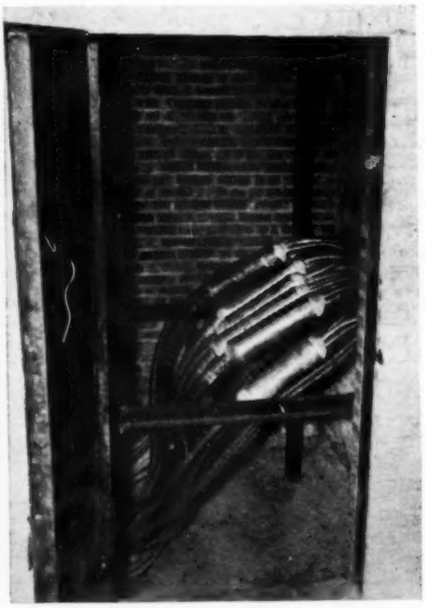




ENTRANCE PULL BOX *on the building side of the underground power company transformer vault No. 1 is constructed of transite board in an angle iron frame. It is free standing and helps support the transite ducts.*

NETWORK PROTECTORS *mounted on these two 500 kva., three-phase, pyranol filled transformers in vault No. 4, completely isolate the faulty transformer or feeder. This permits repair at convenient time and eliminates emergency work.*

TRANSITE DUCTS *supported by a continuous angle iron framework, carry the twenty-four 500,000 cm. and eight No. 4/0 lead covered cables to the main switchboard in the Capitol building.*



CABLE VAULT *in the main switchboard room contains the splices of each group of four new lead covered cables which replaced the large existing single conductor cables in the steel underground conduits.*

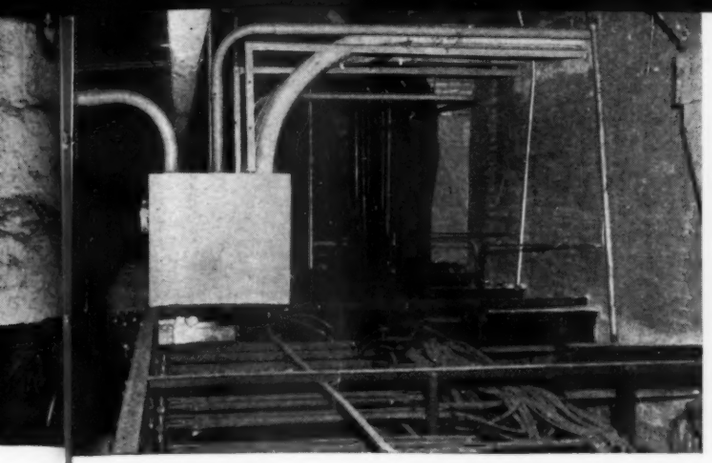
No. 1 the normal source; vault No. 2, the normal supply for the Educational building and vault No. 3 serving the State Office building, both of which can be used for feed-back purposes in case of emergency. From the power company transformers in underground vault No. 1 the cables are brought directly to the main Capitol switchboard, a distance of 210 feet, without a disconnecting means at the building entrance. Since it was impractical to imbed the service conduits in concrete or run them under the basement floor, as required by the Code, the service cables were installed in transite duct, thereby eliminating the entrance disconnect.

This secondary circuit from the transformers to the switchboard forms what is known as a common service and consists of twenty-four 500,000 cm. lead covered cables, eight cables per phase leg and eight No. 4/0 lead covered cables for the neutral leg. These are all installed in eight 4-inch transite ducts suspended from the basement ceiling by a continuous angle iron framework. Two right angle turns in this run were taken care of by the construction of transite pull boxes made of ½-inch transite board framed in 2½-inch by 2½-inch angle iron. In two places along the run the ducts were offset to clear a fresh air duct in a transformer room and to overcome a difference in ceiling height.

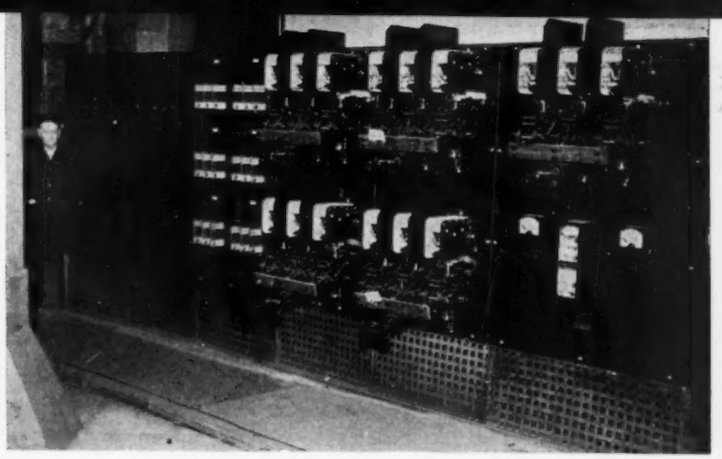
At the main switchboard, the transite ducts terminate in a large pull box mounted above the new section. This new addition to the board contains five three-pole 2000 ampere air circuit breakers and numerous branch breakers for the Capitol building circuits. These five 2000 ampere breakers are all connected to a common bus on the board. Two of them are connected to the circuit from vault No. 1. This places one half of the total load on each breaker. The other two large breakers are on the circuit to the network transformer vault No. 4, in the same building. The fifth breaker is connected to cables which feed the Power House and Educational Building.

The tie-in of the network system centers at the main switchboard and in transformer vault No. 4 which houses the network transformers, grids and protectors. A 2300 volt tie-in circuit from the standby primary service in the State Office Building vault No. 3, 1300 feet away, is brought via a steam tunnel into the primary side of the two, three-phase, 500 kva., delta-star connected pyranol transformers complete with network switches and protectors. From the secondary side of these transformers the circuit is continued with eight 500,000 cm. cables per phase and eight No. 4/0 cables per neutral leg, all enclosed in eight 3½-inch conduits overhead to the main switchboard. Here they are connected to the 2000 ampere breakers. In an emergency, the reverse current features of the two transformers can be eliminated and the office building can be fed 2300 volts direct. This is sufficient current to carry this building in case of breakdown of their own service. Also, the Educational Building can be fed from either or both the Capitol and the Office building.

It is in this vault No. 4 that the



SWITCHBOARD PULL BOX *mounted above the new addition to the main board in the Capitol building is the terminus for the incoming transite ducts and the outgoing steel conduits (on left) to the network vault No. 4.*



NEW ADDITION *to the main switchboard contains the five 2000 ampere network air circuit breakers and the new branch breakers for the Capitol building circuits. Knife switch section to left is part of the old board which is not shown.*

automatic switchover to the supplies of active current occurs whenever faults arise. In this network system, the secondary mains are connected together at the Capitol to form a grid covering the Capitol, Educational and Office buildings. The automatic network protectors in the secondary leads connect the transformers to the secondary grid. It has been found that in the maintenance of continuous service, faults which appear in the secondary system feeders usually clear themselves and are usually allowed to do so. But, faults appearing in the primary service must be quickly isolated. The network protectors are so constructed that they open when the current flows in a direction opposite to its normal flow. Oil circuit breakers, tripped by overcurrent relays, connect the primary feeders to the station bus.

Therefore, when a fault occurs in the primary feeder system, the station breaker is opened by overcurrent and the network protectors are opened by the reverse current fed into the source of the trouble by the network. In this manner the feeder or transformer vault is completely isolated from the rest of the system and the feeders from the two remaining buildings divide the total load of the secondary system. If necessary, one feeder can carry part of the load of the three buildings. This complete isolation of the vaults permits their repair at a convenient time.

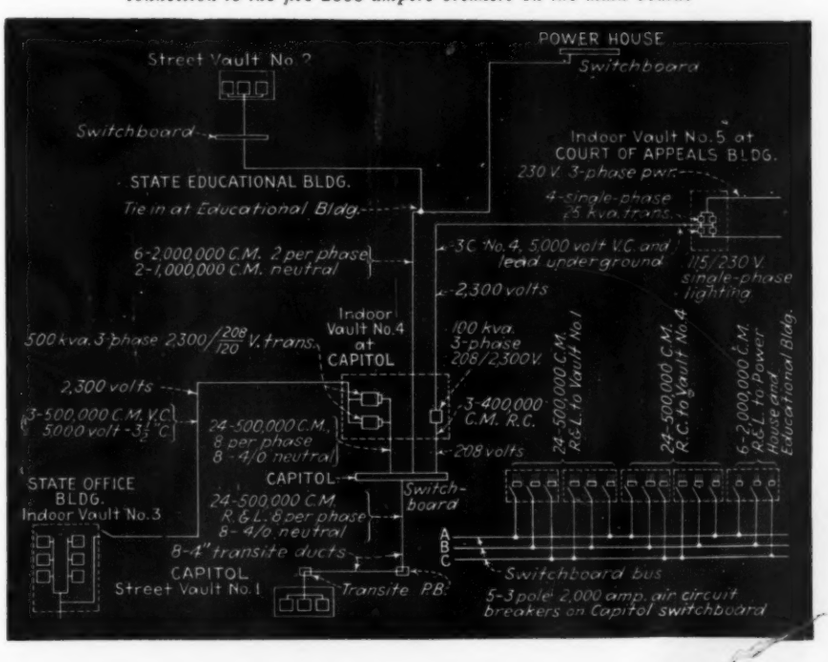
All the circuit breakers are tied in so that all primary feeders are supplying the total load. A totalizing meter determines how much current is used by all three buildings, how much each building uses, what primary feeders are supplying the current and the amount each feeder is supplying. It is only by checking the meter, therefore, that any faults may be noticed in the primaries.

A supply feeder to the Court of Appeals extends from the Capitol switchboard to the low voltage side of a 100 kva. three-phase transformer in the network vault No. 4. Here it is stepped up to 2300 volts and goes underground for 1500 feet to indoor vault No. 5 in the Court of Appeals Building, where it is stepped down to 230 volts for power and 115/230 volts for single phase lighting. Low tension distribution, instead of high tension, was used to the Educational Building and Power House to utilize the existing 1,000,000 and 2,000,000 cm. cables which were formerly used to carry direct current. From the tie-in at the Educational Building to the Power House there were twenty-three 1,000,000 cm. slow burning cables installed in the wall of the steam tunnel. Of these only seven now remain, the others, totalling 62,000 pounds of copper, were removed under this contract.

The existing feeders in the Capitol are distributed through an underground system of manholes and fibre duct except in one place where steel conduit was used. The large cables running between the Capitol and the Educational Building were installed one to a duct. When alternating current is used all three cables must be in one conduit, so the cables in this section had to be removed and four small cables installed in each steel conduit. These splices were made, using six-inch lead sleeves, in a cable vault in the main switchboard room and in a manhole at the other end.

Maintenance of service during the course of the contract, the installation of the network, the changing of the switchboard to operate on alternating current and the changing of all motors, was highly important to the state. The service was maintained throughout the buildings with only a maximum twenty-minute interruption on the actual change of secondary feeders from d.c. to a.c. There were less than 50 hours of overtime in a total of 10,000 labor hours.

ONE LINE DIAGRAM *showing the network distribution system which interconnects the individual services of the state capitol buildings. The detail shows the common bus connection to the five 2000 ampere breakers on the main board.*



Wiring STEEL

Twelfth in a series of industrial reminder lists to help the electrical contractor design and sell a complete electrical installation

STEEL fabricating plants are the medium through which the standard stock steel sections, produced at the rolling mills, are transformed into the steel structural members we find in our buildings, derricks, trusses; the huge steel tanks, vats, pipes and the hundreds of other steel structures we find in modern industry.

These plants, whether large or small, use essentially the same type of equipment, differing only in size. But, in all cases it must, of necessity, be power driven. And here electricity and the electrical contractor enter the picture.

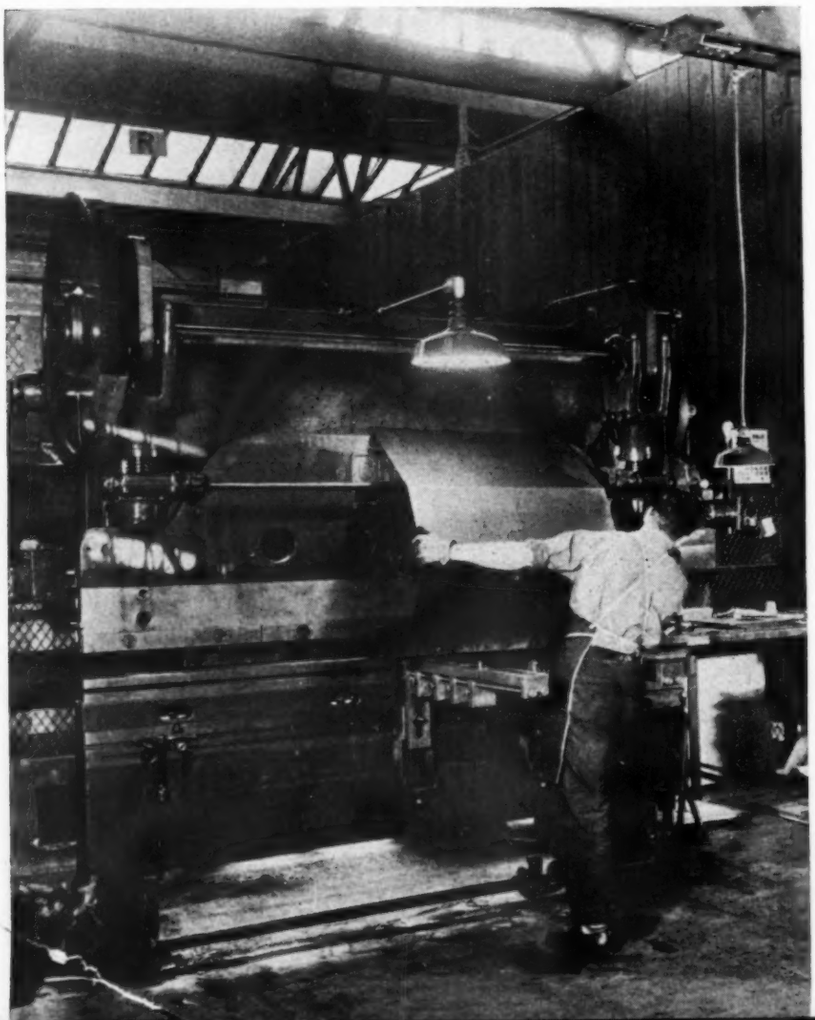
The machine tools of the fabricating industry must develop huge stresses to shape the steel into the desired form. And the motivating power must be easily and accurately controlled. So, electric motors are used for the cutting, punching, drilling, bending and rolling operations. Electric heat is used for annealing, heating and tempering. And electric welding is being used more and more in the final fabrication stages. Through all these steps, convenient control of the machine operation is necessary both to expedite production and to prevent accidents which hazard life and limb.

But good illumination must be considered just as important as machine operation. Better lighting, both from the standpoint of general illumination and individual localized machine lighting, permits closer tolerances, increased accuracy and productive efficiency, as well as reduced occupational accidents.

Today, due to the national defense program, steel fabricators are called on to meet production schedules never before attained. This means plant expansion, more production machinery, increased efficiency, night shifts, uninterrupted production schedules. The entire plant organization must be more closely coordinated. This means intercommunicating telephone systems, convenient signalling systems; all designed to reduce lost motion and labor. And all of this must be supported by a well designed and trouble free electrical system.

For your convenience we list, on the following page, various machines used in the steel fabrication industry. Make this list your guide when planning wiring systems for this type of plant.

BENDING SHEET METAL, *with power brakes, is an important step in the steel fabrication industry. Tank sides for underwater floodlights are being formed here.*



L FABRICATING PLANTS

ELECTRIC WELDING *is one of the final stages in some forms of steel fabrication. Here three I-beam legs of a steel tripod, for oil machinery, are being welded to anchor plates.*

Check List for Steel Fabricating Plant

Motor Driven Equipment
(some motors must be totally enclosed fan-cooled type)
Air Compressors
Band Saws
Battery Charging Sets
Bending and Forming Machines
Blowers
Boiler Shell Drill
Bolt Machines
Boring Machines
Boring Mills
Buffing and Grinding Lathes
Circular Saws
Cranes
Drills
Elevators
Flue Welders
Forge Welders
Foundry Blowers
Grinders
Grindstones
Hacksawing Machines
Hammers
Hoists
Lathes
Lift Drops
Milling Machines
Pipe Cutting Machines
Planers
Plate Bending Rolls
Plate Welding
Pumps
Punches
Riveting Machines
Saws
Shapers
Tapping Machines
Threading Machines
Trucks—electric
Tumblers
Welders—electric
Heating Equipment
Furnaces: Annealing, Heating and Tempering
Signal Equipment
Sirens
Horns
Bells
Emergency Signals
Code Signals
Fire Alarm
Elevator Signals
Crane Signals
Intercommunicating Telephones
Watchman Clock Systems
Time Clocks
Signs
Illumination
Recommended intensity for structural steel fabrication is 10 foot-candles

. . . and NOW ELECTRIC HEAT

By C. A. Rowley
Electrical Specifications Bureau, Pasadena, California

THE Red Seal and Adequate Wiring plans have raised the standards of home wiring. The Electrical Cookery Council and campaigns to promote electric water heating have helped educate the public to more generous use of electricity in the home. And now it is the psychological moment, for electric heat. Here is a sales tool for the entire industry. It is "plus business" for every contractor, wholesaler, manufacturer and central station.

I mean exactly that. I really believe that electric room heating—particularly bathroom heating—can be profitably sold and used in every state of the Union. It goes without saying that complete home heating is not feasible in sections of the country where subzero temperatures are common. But there are many homes in every community where electric heat can and should be utilized to supplement an existing or contemplated heating system.

Bathroom heaters are widely used even in the cold belts, both as the only means of heating and as an auxiliary to the central plant. For many weeks in late spring or early in the fall before the furnace fire is started, these heaters supply safe, quick and pleasant bathroom comfort at nominal expense. Their simple but smart styling harmonizes perfectly with present streamlined bathroom designs.

An important characteristic of these heaters is illustrated in the photograph. The lower or occupied portion of the room—the "living zone"—is kept comfortable without wasting heat in the upper or unoccupied portion. Delivery of the warm air stream horizontally near the floor retards stratification to the extent that temperature variations from floor to ceiling rarely exceed 3° F. The definitely higher utilization efficiency of fan-type heaters indicates why they head the list.

Electric heating in general lends itself to load diversification, and, being almost totally non-inductive, tends to improve system power factor conditions. Annual consumption is high.

In fact, with complete electric heat in a given residence, it will equal or exceed all other uses combined including water heating, cooking and refrigeration. However, where properly adjusted rate structures exist, operating expense compares very favorably with other means of heating. Throughout the Old South and up and down the Pacific Coast area there are many thousands of "all-electric" homes heated exclusively by electricity. Owners of these homes enjoy a degree of safety, cleanliness and all-year instant availability unknown with any type of fuel heat. Truly electric room heating has arrived.

HEAD TO HEELS *heating is salable over most of the U.S.A. for spring and fall use and auxiliary service, if not for exclusive heating.*

Installation Data

In support of the foregoing statements, the following data on installation costs, required heater capacities, etc., will be of especial interest to contractor readers—

The only accurate method of determining heater capacities is to calculate heat losses for each room. These, of course, are dependent on several factors such as indoor and outdoor temperatures, type of construction, window and door area and extent and nature of exposure.

Once thoroughly grounded in these fundamentals, however, any intelligent contractor will be able to lay out and install successful heating systems.

For any given climatic condition, and type of construction these calculations can readily be reduced to a formula or "rule of thumb" sufficiently accurate for average use. As a case in point, it has been determined that two watts per cubic foot is approximately correct for temperature and other conditions existing in Southern California.

[CONTINUED ON PAGE 32]

We Start With HORSE SENSE

Then using a bonus for a whip, we encourage the development of cooperative efficiency in our motor shop. It stimulates apprentice training, keeps the older men on their toes.

By Anthony J. Kaiser
Partner, General Electrical Specialty Co.

OPERATING a modern motor repair and electrical service shop demands a constant alertness to new methods and techniques, a willingness to investigate and adopt new equipment. Every shop owner knows that—but we think there is one factor that goes beyond technological development: the human factor.

When many men are engaged on different phases of the same job, the speed and quality of the completed work is only as good as that of the slowest, least capable man who has had a hand in it. With the system that we have developed, we get the wholehearted, thorough cooperation of every mechanic and employee. Not only is his own work done in the best possible manner, but also he constantly checks on his co-workers' functions in the interest of the finest finished job for the customer.

We experimented with many forms of compensation until we settled on our present method in which a monthly cash bonus is the "whip" that constantly spurs everyone on to greater accomplishment. This bonus is not predetermined, but varies from month to month with shop volume and the relationship between fixed overhead and net profit. The percentage of the net profit that the bonus represents in a big-volume month is larger than in a slow month.

When the accountant has determined the total amount of the bonus, this figure is divided by the total number of hours worked, and distributed among the employees. Say $100 represents the month's bonus, and 1000 hours have been worked. That would mean a 10-cent-an-hour bonus: the man who worked 200 hours during the month would get a $20 bonus, another who had worked 150 hours would get $15, and so on. These figures are given merely to demonstrate the principle.

And just what does this accomplish? Well, if any motor repair needs to be redone, or if a job comes back to the shop for further adjustment, that naturally cuts into the month's profit. If something goes wrong, requiring extra time, that is another slash at profit. So if the bonus checks at the end of the month are lower than the month before, the men are reminded that it was the Smith or the Jones job which caused the drop—and the simple reminder has more of a tonic "pep-up" effect than hours of lecturing!

The result is that none of our men feels that as long as he does his job properly everything is all right. Each employee realizes that his earnings depend to some extent on how well everyone in the organization works. So no mechanic is too proud to lend a hand or make a suggestion on another's work.

Extra Money

Our bonus is real extra money—for our men are paid well: prevailing wage scales are the minimum and in some cases they get substantially more. We feel that all skilled mechanics should get the same rate of pay, regardless of their type of work, and this plan has eliminated the petty jealousies that arise when a man gets to thinking "I ought to get more money than Bill because I'm a better machinist than he is a winder!"

We have another bonus payoff, too, that keeps the shop clean the year round: all scrap copper and old wiring is carefully saved, baled and sold. The proceeds are the Christmas bonus—an extra payment—and the men know that every ounce of metal means extra pennies to them at Christmas. This is shared equally among the men. Some years the cash bonus for each man has run as high as one hundred dollars.

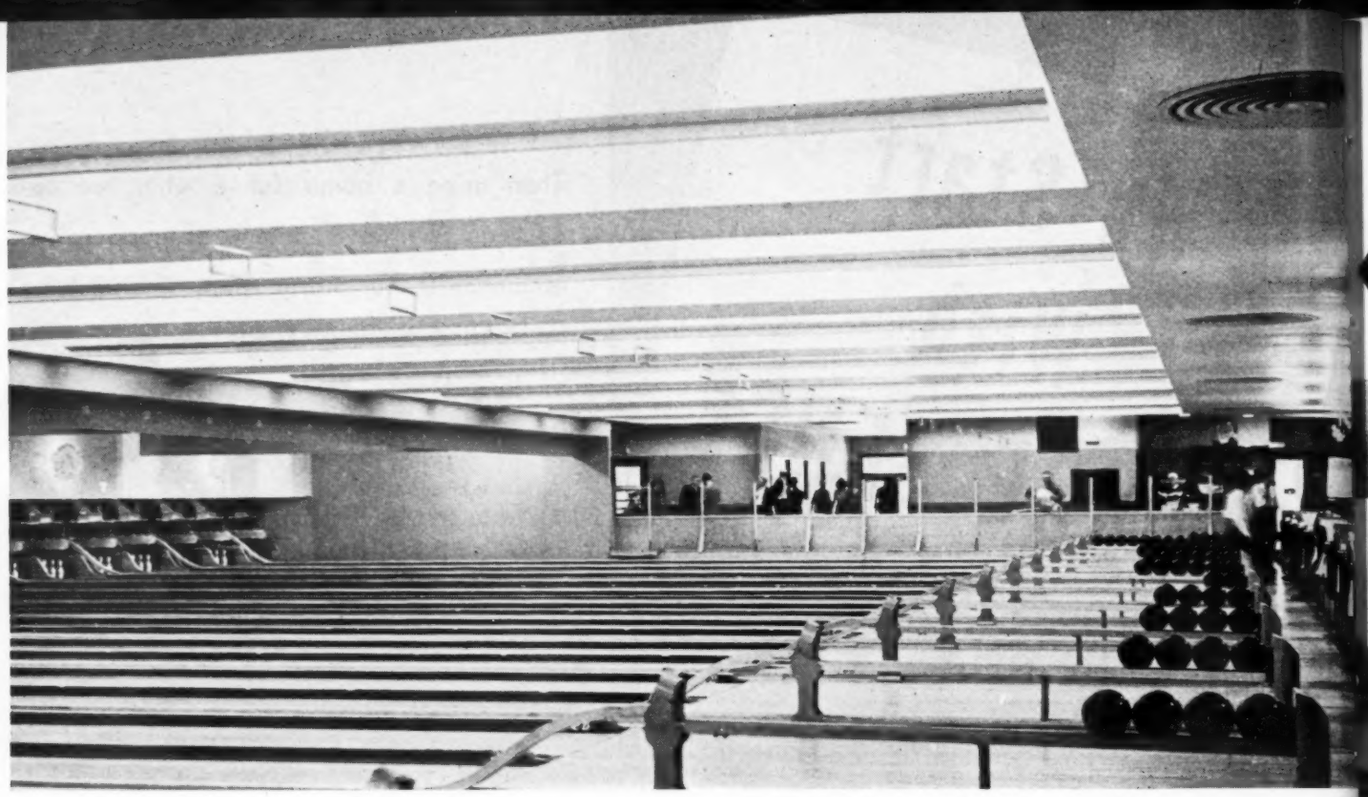
Such liberal compensation might suggest that our men are unusually capable. We think they are—because we have trained each of them in our own special way. Like other motor repair shops, we have found that competent and efficient mechanics—not "floaters"—are rarely looking for work. So we have been forced to train our own employees, educate them firmly in the way we want them to go.

About once every three years we have added a new helper: a young man recommended either by an employee or a customer. In making the selection, we don't care a great deal about education. We would rather not take a lad with any substantial amount of experience in other motor repair shops. We want a young man with reasonable ambition, and plenty of good horse sense—a fellow who is willing to learn and able to take orders.

It is carefully explained to the applicant that it will be at least four years before the organization can expect to break even on his salary; that it will be six to eight years before he can even call himself a fair-to-middling mechanic; and that under any circumstances he must never stop learning if he wants to succeed in this business. The starting wage is an absolute minimum; increases come gradually as the young man evidences ability. Right at the beginning he is told that everyone in the shop will be watching his progress, and that when he merits more money it will be given to him.

The new helper begins his training with a two-week probationary period in which his aptitude, interest and ability to follow instructions are carefully

[CONTINUED ON PAGE 83]



Fluorescents for BOWLING

SPECIALIST *in fluorescent lighting design and installation, electrical contractor Elton A. Gould believes in keeping in close touch with the newest developments in the field.*

Evenly diffused indirect fluorescent lighting installed by the Gould Electric Company in Chicago's new Lawrence Bowl is a novel and successful approach to the bowling alley lighting problem. Here is how it was done.

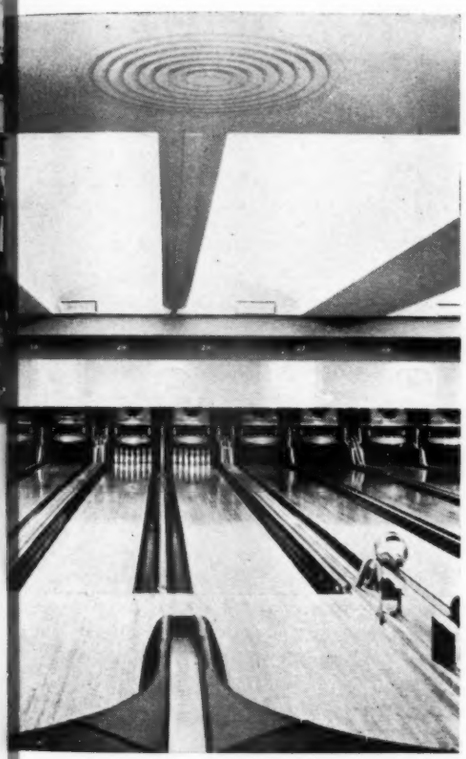
TALK of the kegler clan around Chicago is the recently opened Lawrence Bowl, a 32 alley installation in the densely populated uptown area. And the conversation always gets around to the novel lighting treatment that has been applied there.

Behind this exceptional job, which is already stirring up interest among bowling alley owners over the nation, is some expert engineering and careful design by Elton Gould, Jr., of the Gould Electric Co. of Chicago in cooperation with architect Herbert B. Biedler. And, incidentally, this is a splendid example of what the up-to-date electrical contractor can do for his customer, when he has the confident cooperation of the architect in the preliminary building design.

Chief feature of the lighting system is the use of continuous indirect fluorescent luminaires, parallel with the alleys, in a specially designed vaulted ceiling. The resulting illumination, which averages about 20 foot-candles, gives a smoothly diffused light over the alleys without shadows or bright spots. Besides providing illumination of a high order of technical excellence, the installation presents a very attractive general appearance.

The alleys are built in a remodeled garage building which offered some useful construction features. The brick and steel truss construction provided a clear, unobstructed space without columns for the full length and width of the building. Alleys are built across the width with the spectator galleries along the western wall. The south end of the building facing the street is devoted to lockers, utility rooms, offices, a cocktail lounge and restaurant.

INDIRECT FLUORESCENT *luminaires suspended in ceiling coves provide evenly distributed light over the alleys. Each luminaire contains two continuous rows of fluorescent lamps.*



The 12-foot ceiling extends down the alleys, for about ⅔ of their length, to a curtain wall which drops to within eight feet from the floor. Another curtain wall drops in front of the pin racks. The area behind the curtain wall is unfinished above the line of sight.

Ten ceiling coves, 41-ft. long by 15-ft. wide, 20-ft. center to center, provides the principal source of illumination. In the center of each cove is a wiring channel and reflector with two continuous rows of fluorescent lamps in each.

Lighting the tally sheets in the spectator area is a row of fourteen suspended fluorescent luminaires with five 40 watt white lamps in each, spaced on 15 foot centers. Behind the first curtain wall is a row of 200 watt incandescent floodlights, one light for each two alleys. Halfway between the first curtain wall and the pins is a row of suspended reflectors with two 40-watt fluorescent lamps in each, for each two alleys, providing illumination between the curtain wall and pins.

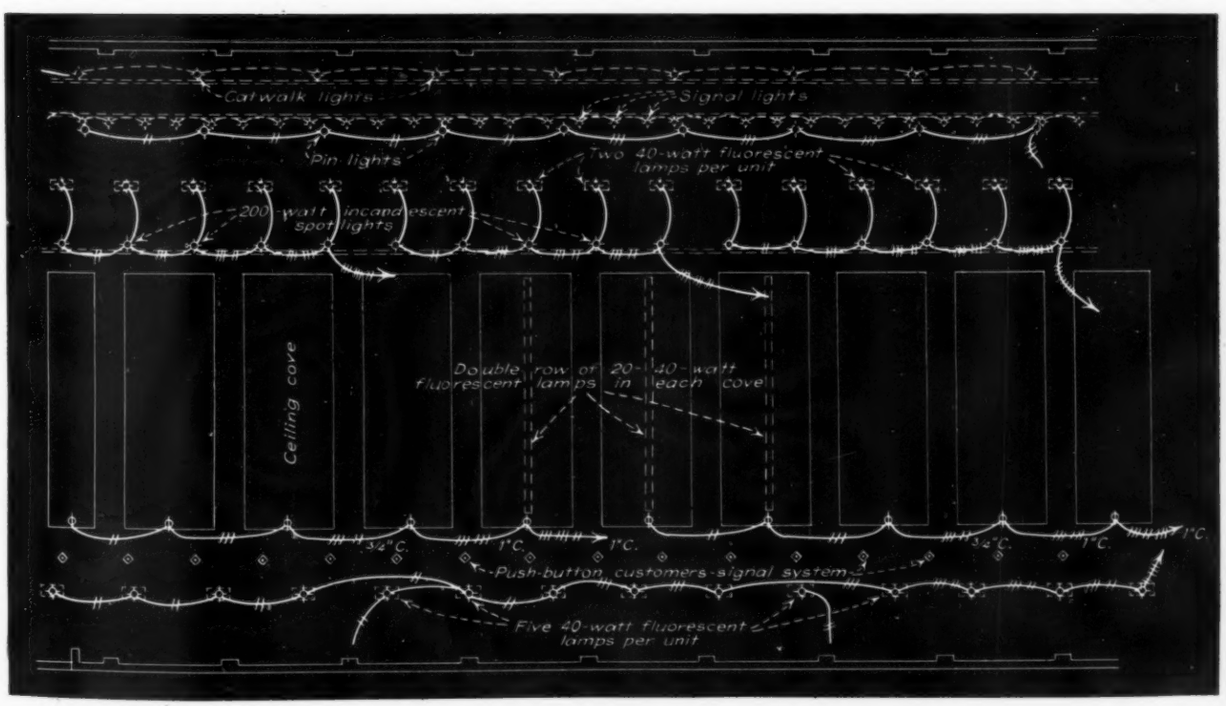
Wiring for the lighting system is installed in electric metallic tubing above the suspended ceiling. Each of the indirect fluorescent luminaires, which contain 20 — 40-watt fluorescent lamps with high power factor two lamp ballasts are wired on an individual circuit of No. 12 wire. Each of two home runs carries the conductors for five luminaires grouped on two 3 wire common neutral and one 2 wire circuit. Three circuits feed 12 of the suspended luminaires over the spectator gallery, the two remaining units are connected to an emergency lighting system. Each floodlight and suspended fluorescent luminaire combination behind the curtain wall is provided with a separate circuit. Each group of five circuits are grouped in a common home run to the control panelboard.

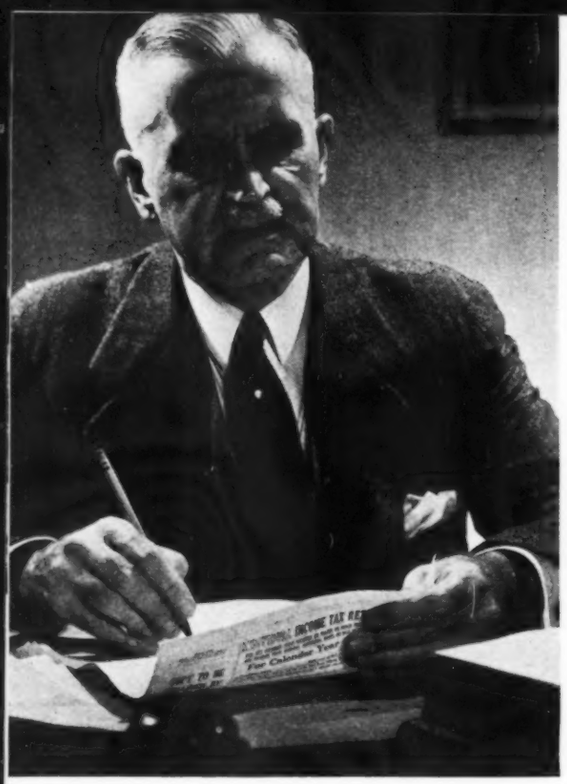
The entire lighting installation is controlled from the general service counter. Multi-breaker type panels provide for switching and protection.

General lighting service is three 350,-000 cm. conductors, 240/120 volt single phase, in a three inch riser terminating in a 400 ampere service switch. A separate 3/0 three phase power service is brought in for the approximately 50 hp. of air conditioning and maintenance equipment. A separate emergency service provides for three circuits of emergency lighting and exit lighting.

An interesting installation of foul indicators for each alley was provided. Control panels in each of two judges stands at either sides of the alleys operate signal lights at the end of each alley. The cut-out letters of the foul signal are concealed in the back curtain wall behind a translucent panel and are not visible until the lamp is energized.

LAYOUT PLAN *showing the arrangement of the circuits for the lighting units over the alleys. Wiring system is No. 12 wire in electrical metallic tubing.*





Your TAX PROBLEM

How good management and accounting can affect tax savings, with a list of taxes contractors must pay.—Suggested methods of reducing them.

By Arthur Roberts

TAXES are one of the burdens of business today and bring vociferous criticism from all fields of activity. And the electrical contractor comes in for his share of them. In some cases nothing much can be done about it. He just has to grin and bear it. However, there are a number of cases where proper understanding of the tax law, proper management of the business and intelligent accounting can affect tax savings.

The taxes which beset the contractor may be grouped into three classes:

A. *Property Taxes.* These include taxes on real estate, license fees and business franchise and a fixed expense because they are levied on assets.

B. *Sales and Expense Taxes.* Social security payments, unemployment insurance payments, and sales taxes. These variable expenses depend on volume of labor and material used.

C. *Income Taxes*—both Federal and State, are levied on the profits made.

Now, we know what the taxes are. How can we reduce them?

Reducing Property Taxes—Property tax is just another form of rent and like rent it appears high when income from sales is low. When the ratio between the two becomes too high the following remedies may be applied.

1. Appeal to the local tax boards for a reappraisal and reassessment.

2. Increase your sales, thereby reducing the ratio of property tax to sales. This is apparent if you consider the tax as an expense ratio to sales. The electrical industry has many sales promotional programs whereby the contractor, if he will take an interest in them, can materially increase his business volume.

3. Reduce the amount of your fixed assets. If the property taxes are still high, in spite of a sizeable volume of business, it may indicate that too large a percentage of your net worth or surplus is in fixed assets. If your business is burdened with property in excess of its requirements you had better sell or rent part of it.

Sales and Expense Taxes—As outlined, these are definitely direct job expenses and should be included as such in all estimates and contracts. Do not include them as a part of the general overhead. You may not get them back.

Reducing Profits Taxes—These income taxes offer the most opportunities for economies. For, in filing these returns the contractors are prone to make errors which increase their taxes. These errors are centered, to a large extent, around incorrect charges to assets, capital, maintenance; incorrect costing of inventories; disregard of depreciation and obsolescence and the carrying over of bad accounts.

A comprehensive understanding and intelligent application of the following suggestions will, in most cases, materially reduce the taxes levied.

1. Be conservative in adding charges to the building value or other assets. Increased assets increase the tax.

2. Be conservative in capitalizing maintenance expenditures. There are many borderline cases where expenditures which enhance the value of the property can be charged to maintenance.

3. Charge off depreciation and obsolescence, as much as you are entitled to each year. By doing this the assets are always kept down to a conservative level. If an item can be interpreted in two different ways, with equal propriety, use the interpretation most favorable to your organization.

4. Cost your inventories correctly. Correct accounting demands, when filing returns, that cost or market prices be used, whichever is lower.

5. Deduct substantiated uncollectible accounts each year. Carrying them over from year to year increases the net worth and consequently the tax.

6. Pay all expense bills before the end of the year to get in these deductions. It may prove economical to borrow the money to pay these bills because of the tax reduction gained.

7. If the business is done on an accrual basis, include all accrued items in the taxable year. Do not overlook interest and payroll. Uncollectible items of income need not be accrued for tax.

8. Be sure you understand thoroughly the income tax law. Its complicity and ambiguousness often makes it desirable to consult a banker, public accountant, lawyer or tax expert. If your staff files the returns, make sure they are familiar with the latest rulings and decisions.

Organize Tax Data—Keep up to date on all tax legislation which directly or indirectly affects your business. Build up a reference on your tax problems.

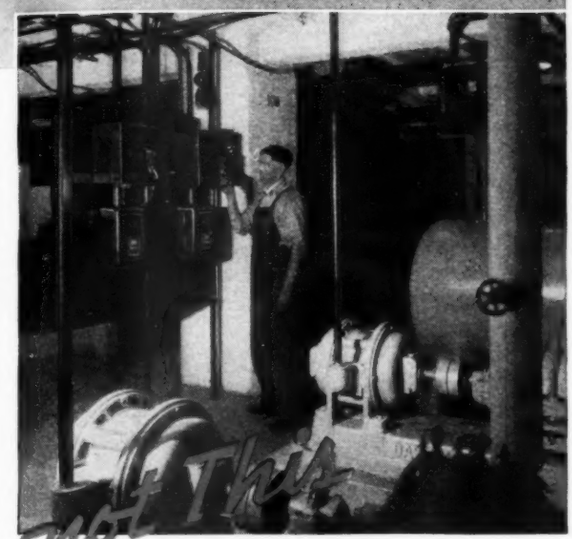
Keep a tax file—This can become a reference file of newspaper reports and clippings of changes and amendments to tax laws and new legislation.

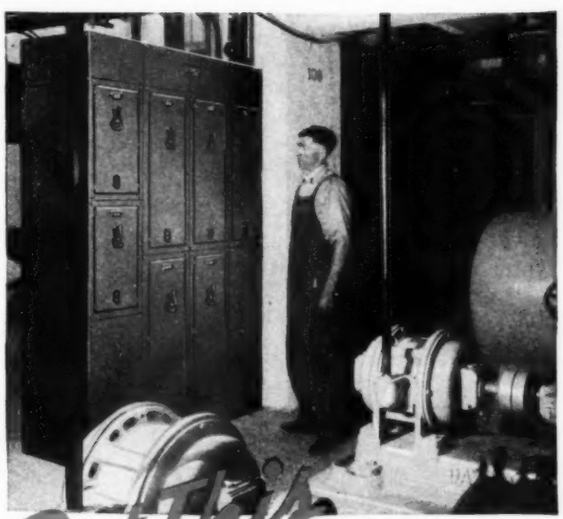
Keep a tax calendar—This is a form showing the due date of each tax, date the tax blank is received and returned to the file and the amount of the tax and the payments. It is a complete tax record of your organization in a concise form and ready for quick reference.

3 STARTERS...OR 3 MILES OF STARTERS

It's a job for UNITROL

TRADE MARK





More controllers, same room... and note how much space saved, how much money saved, how much easier to install and attend. How much easier to change in accordance with your changing needs.

And Unitrol brings so many collateral advantages to all departments of business, even to architects, builders and engineers, that almost every firm in America should have a copy of the book "Unitrol... the next step forward in Motor Control Practice". Sent free when requested on your letterhead. Don't wait. Write TODAY.

A new, swift, timely answer to many of Industry's most pressing problems. Vital to nearly every industrial executive, engineer and builder, Unitrol is a space-saving, time-saving, money-saving method of motor control modernization and centralization. Whatever you do, get a copy of the new, free descriptive book.

Unitrol is a new type of enclosed unified control center... produced on order and to your specifications from standardized and interchangeable parts in stock. The secret of its low cost, flexibility and versatility is its new simplified construction. By means of this new construction Cutler-Hammer Magnetic Control, NEMA sizes 1, 2, 3 and 4 may be readily and quickly assembled into a compact and continuous housing which conforms in every way to the space at your command, to the operating requirements of any plant or machine or group of machines. Unitrol is just as big or just as small as you want it. And at any later time, it may be expanded, contracted or changed in line with your own changing requirements.

Ready for the job, complete in every way... Unitrol is the most compact type of control center construction available today, and its compactness makes amazing space economies available. It requires no wall or floor preparation, no building alterations... and may save you the necessity of new construction.

It is so economical that its completely installed cost is less than that of any comparable home-made substitute.

Its design, its construction, its range, its flexibility and adaptability... its ability to save space, time, money and building are all completely described in a new book just off the press. A copy of this book "UNITROL... the next step forward in Motor Control Practice" will be sent without charge on request. Write immediately: the pressing needs of today call for this new type of Motor Control centralization. CUTLER-HAMMER, INC., *Pioneer Electrical Manufacturers;* 1306 St. Paul Avenue, Milwaukee, Wisconsin.

CUTLER-HAMMER
UNITROL
C-H

3 Steps

1st... The Unitrol Unit

The basic element of Unitrol is a simple unit mounting-frame into which any standard control device may be bolted. This unit frame has integral with it a hinged cover or door which may be blank, or arranged for either dead-front manual or push-button operation of the device enclosed.

2nd... The Unitrol Section

The Unitrol Section is a steel enclosure which houses and supports a group of Unitrol Units. It is constructed of standardized interchangeable members to form the sides, top and back... with unique provisions for bus supports, wiring troughs, conduit or duct entrances, etc.

3rd... The Unitrol Control Center

A Unitrol Control Center consists of a grouping of Unitrol Sections fabricated into a complete sectionalized assembly and delivered ready for installation and use.

Earl Whitehorne, Editor

Getting into War Order Plants

Electrical contractors who want to play a profitable part in the preparedness program, through helping to modernize local factories, better move fast. Little by little the old secrecy spirit is going to spread. And its going to be harder and harder to get into plants where Government orders are involved.

Make your contacts with the managers now. Discuss what can and should be done. Get plans moving. Be on the inside and part of the supporting service before anybody says—"Who is this guy?"

Contractors Still Lag In Adequate Wiring

Once again the men concerned with promoting the Adequate Wiring Campaign are holding experience meetings about the country. In San Francisco, Chicago and other areas they are reporting the progress of the year, exchanging methods, gathering new zeal to go forward.

Progress has been slow and small. It has been worthwhile, however, to the industry and profitable to those who have been smart enough to participate. But the fact remains that there is an amazing indifference to the whole idea on the part of house wiring contractors, who should welcome it with a glad cry. Many of them just won't bother to pay the two dollars for a certificate and sell it to the householder.

The delusion apparently still prevails that Heaven will provide continuing expansion in the electrical business to carry the contractor along without selling. But it is a sorry commentary on the part we ought to play in this Adequate Wiring Campaign. It is fashioned for the contractor first of all. He needs but to tie in to enjoy a larger prosperity and satisfaction. How long Oh! Lord!

Fluorescent Tube Renewal

Speaking of fluorescent lamps—and who doesn't?—here's a question. Who is going to sell the tube replacements for the installations that the electrical contractor is now putting in so feverishly around the country?

They give away safety razors, so they can sell replacement blades. They price cameras low, so they can sell film. And there is a great future business in tube renewals available to every contractor. But it won't knock him down and climb into his lap. He must organize a follow up replacement service if he wants this gravy.

Use Inspection Revenues

Some communities make a profit on the service of their inspection departments and put the money in the Big Pot. But it is a poor service to the public because it impoverishes the inspection department.

The need for reinspection of all types of buildings looms steadily larger, and mighty little is being done about it throughout the country. The reason is obviously the lack of men, but it is growing more vital every month. The overloading of lines, the need for rewiring to keep step with the expansion of electrical usage, all create emergency. Inspectors, therefore, should fight for the segregation of the income from their departments to be devoted to the expansion of the inspection service. This may well be the most important issue before the electrical inspectors of this country today.

Chimes Gone Coo-Coo

A lot of sin has been spread in the production of our new sweet sounding door bells. The popularity of chimes, has thrilled many manufacturers and gaudy bargains have been rushed into the market to sell in the department stores. As though it was only necessary to take 'em home and hang 'em on the wall.

But chimes are electrical fixtures. They must be wired and installed. They must have artistic merit if people are to live with them. They must be mechanically and electrically sound if they are to last.

The department store may sell them. But they should not be sold as Christmas novelties. Some contractor should have a tie in with every dealer to insure that he sells good chimes and that it is made automatic and easy to get them installed when bought.

NISA Promoting Factory Service

The motor shop men organized in NISA are working up a promotion program to strengthen the factory service of the average motor shop. For a long while, many contractors and motor shops have felt barred out of factories with well equipped plant maintenance staffs. But not so.

Maintenance is an art and a work unto itself. Efficient factory staffs are focussed on prevention of electrical troubles. They need help on emergency breakdowns in motors and extension wiring of any size. They do not want to demoralize their regular inspection and maintenance work by these diversions. They should have standby service from a contractor and a motor shop ready on call.

It will be a big asset to industry if that idea can be widely sold by NISA. Much business waits here.

These "Tenants Facilities"

Our business grows steadily right under our noses and a lot of us are unaware of it. Consider the modern apartment, for example.

So called "garden apartments," two story groups of centrally heated and operated buildings, are popping up all over the country in large and small communities. They are full of new ideas called "tenant's facilities" like electrically equipped laundries, photographic dark rooms, recreation rooms, roof gardens. And what do you suppose this means to all the older apartment houses?

It means that the older houses will have to cut their rents or accept less desirable tenants unless they compete in kind. Talk to the operators, bankers and real estate people that are involved. There is a lot of profitable business waiting here too.

Glare Still Dominates the Picture

Enthusiasm over fluorescent lamps is a poor substitute for engineering. And these people who think that because the tube looks soft there is no need for protection from glare better watch out.

Eyes and health are still the prime consideration in good lighting—more important than efficiency—and the new tubes with their coolness are contributing greatly. But when you start massing tubes and forget brightness, trouble is coming.

Let no contractor waste what he has learned in the past twenty years. For there are plenty of protectives in the form of louvres and indirect reflection.

Get 'Em To Help

March alone down the middle of Main Street and people will think you're nuts! Gather a crowd and they'll be curious and want to know why. Get a brass band and march behind that and you've got a parade. That will stop everybody.

Just so, every contractor should work to stimulate the telling of the electrical story in his community. Local contractors associations, active cooperation with the local league, programs for advertising and publicity that everybody supports—these are the things we need right now to capture attention for the electrical story. No man should feel that it is smart to keep quiet about industrial electrification, right now, because the market is so good. Every individual will find more business waiting for him if everybody is after it, for a one-man parade gets little attention.

Back Talk

What To Call 'Em

Answering our little editorial—"Same Old Question" in October asking for a better name than 3-way switch—here are two suggestions:

1. To the Editor—"I nominate 'Two Place Switch' or 'Three Place Switch' as the name for what we now call 3-way or 4-way."

W. Pelham
New Harmony, Ind.

2. To the Editor—"Why not call them multiple switch controls? Instead of speaking of the light as having a 3-way switch, speak of it as having multiple switch control. I'm showing this in a wiring plan. It is very simple to use the figure to indicate the total number of controls on the light in question, such as S-3. This idea has been carried out on several wiring plans drawn for customers' use."

Charles V. Dunn, Technical Adviser on Wiring Promotion, Kansas City Missouri Power and Light Co.

Well, mebbe, mebbe! But who else has a suggestion? What we want is something folksy, simple, just plain talk, no $17 words. We think you'd have to explain "multiple switch control." But the right name will need no explanation. "Wassa gonna be nex?" as Tony says.

Barron—A Correction

In October we published a short editorial paragraph—citing a news report that local electrical supply houses had opposed the licensing of electricians. We have received the following letter about it:

To the Editor—"In looking through the October issue of the *Electrical Contracting* I find in there an article on Barron, Wisconsin, in which you state that the 'electrical supply dealers' oppose the local law for licensing electricians. We would like to know where you obtained this news from. In the first place, Barron, Wisconsin, is a very small town and has a population of about 1800. There is one appliance company in the town with a couple of electricians. We want to know where the supply dealers are?"

D. E. Ford, vice president
Northland Electric Supply Co.
Minneapolis

This bit of news came in from a correspondent, as much material does. It prompted an editorial paragraph but unfortunately we did not check up on Barron. Too bad—but we are glad there are no supply houses there to be offended.

The Fluorescent Situation

Our opening editorial "Romance Goin' Wrong!", discussing present troubles in the fluorescent lighting market, brought us a large number of letters and to our gratification all commending. The following comments from manufacturers are of interest:

1. To the Editor—"It is my opinion that the future of fluorescent lighting lies in the hands of the electrical distributor and electrical contractor. Unless they are prepared to do a sales promotional job, and bring this new light source directly to the consumer, there will always be an opening to the dreaded 'door to door specialty man,' who is only interested in selling a cheap fixture—making a quick profit—and getting out.

"You can do much in your publication in educating the electrical contractor to the necessity of selling fluorescent lighting, and not merely standing by and watching others do the job."

B. A. Mitchell
Mitchell Manufacturing Co., Chicago

2. To the Editor—"You have certainly done an excellent job. All of the executives in our company agree with you 100 per cent.

"We have always done our utmost to protect the electrical contractor on every job. However, when we see conditions existing in the electrical trade as they are today on fluorescent lighting we often wonder if a great deal of the difficulty isn't due to the lack of foresight on the part of the contractor himself. My personal opinion is that the electrical contractor is every bit as important to the safety and well being of the public as a plumber or an architect.

"If electrical contractors want to win the respect and confidence of their customers and the public in general they must render a complete service that will result in a better quality of illumination, increased safety of operation and lasting customer satisfaction. Best of luck to you in your good work."

Earl B. Holdren
Pittsburgh Reflector Co., Pittsburgh

3. To the Editor—"You certainly have hit the nail head right square in the middle in your diagnosis of the growing pains of fluorescent lighting. This kind of talk on your part at this time is an outstanding service which should have a tendency to control the excitement and direct our energies into constructive channels."

D. H. Murphy, president
The Wiremold Co.
Hartford, Conn.

4. To the Editor—"I was happy to have someone who is known to have an overall picture, state frankly what is 'Gone Wrong' with fluorescent. No doubt, your editorial will be read with interest by many in the industry.

"The question remains, how are we to get the message across to the buying public? How are we going to counteract the bombardment of mis-information with which the public is being deceived? After reading your editorial, I feel somewhat more hopeful. If the public could be made to realize that lighting is a specialized field and for advice and equipment, they should go to the established reputable houses where specialists are at their service, we would accomplish something."

Joseph Terr
The Art Metal Co., Cleveland

5. To the Editor—"This is an excellent editorial and goes right to the heart of the situation. We have been in the lighting business for a long time and it certainly is discouraging when you think of the number of unfortunate obstacles that have sprung up all because of the very things you have outlined in your message.

"I certainly am heartily in accord with the thoughts you have brought out."

G. T. Morrow, vice president
Curtis Lighting, Inc., Chicago

6. To the Editor—"Permit me to compliment you on your clear-thinking, farsighted viewpoint on the promotion, distribution, and development of suitable fixtures for fluorescent lighting. The editorial is very timely, and a good analysis of the current situation."

D. G. Cameron, Sales Manager
The Phoenix Glass Co.
Monaca, Penna.

We agree heartily that the contractor has a real responsibility to keep the situation clean both by his own policies and his influence with wholesalers, manufacturers and power companies. Much could be done in each community if the local industry would unite to warn the public that when they buy fluorescent equipment they buy lighting, and need advice, and service from a responsible authority.

IN APRIL WE ANNOUNCED

DRASTIC PRICE REDUCTION

on G-E Midget Metal-clad Switchgear

BASED ON ANTICIPATED DEMAND

NOW you can give circuits up to 5000 volts the same dependable protection used for higher-voltage, high-capacity circuits—and at lower costs than ever before. Recent price reductions on G-E Type MI-9 metal-clad switchgear make available to every industrial plant and public building the economy, safety, and convenience obtainable only with G-E vertical-lift metal-clad.

We have made this price reduction because we are certain that there is a wide need for this equipment in all classes of industry. The new low prices are based on anticipated quantity production of standard units. We are confident that increased sales volume will justify this price reduction.

How About YOUR Plant?

Are you sure of the protection on your incoming lines, power feeders, and motor circuits? Or are you gambling that obsolete, inadequate equipment will get by?

Are you sure that your operators are not taking chances—on the safety of both personnel and equipment—by depending on switchgear that has not kept pace with the growing needs of industry? Many such situations are being corrected by the installation of vertical-lift, metal-clad switchgear.

Completely Factory-assembled

Wide field service and actual operating experience in industry have proved G-E Type MI-9 metal-clad switchgear to be the ideal equipment for service up to 5000 volts, 50,000 kva interrupting capacity. It consists of a completely fabricated, factory-assembled unit, containing circuit breaker, insulated buses and connections, disconnecting devices, sturdy mechanical interlocks, and instrument transformers where required—delivered as a unit ready to put into service, with low (predictable) installed cost.

Get the complete story of this modern shipped-assembled, metal-clad switchgear. Just call the nearest G-E office, or ask for a copy of our new descriptive bulletin, GEA-2249C.

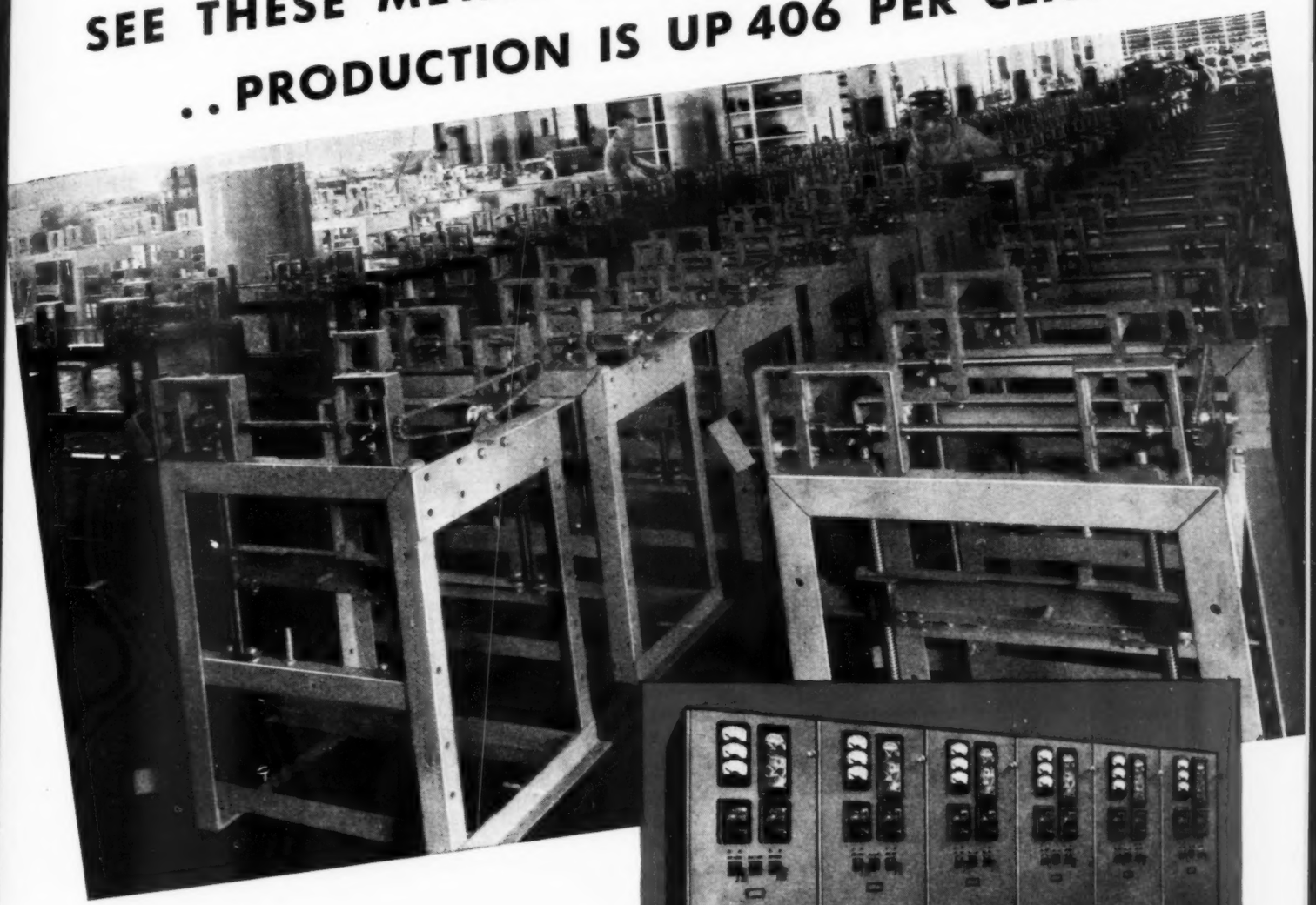
THE VALUE OF THE MI-9

Black
Light Bronze
Dark Bronze

GENERAL

AND TODAY

SEE THESE METAL-CLAD ASSEMBLY LINES .. PRODUCTION IS UP 406 PER CENT



ONLY a few months ago we announced new low prices on G-E Type MI-9 metal-clad switchgear, based on anticipated demand. The response has been even greater than we expected.

You, too, can PLAY SAFE at LOW COST by protecting even your light-duty circuits with metal-clad switchgear. Get the advantages of removable breakers for easy inspection . . . drawout relays, which are always accessible and easy to test . . . and the many other features for reliability and safety. General Electric, Schenectady, N. Y.

▲ Here is a typical Type MI-9 equipment ready for installation. Hundreds of similar standard metal-clad units now in the process of assembly are shown in the large picture above.

GE

E L E C T R I C

WIRING Methods

LAYOUT LIGHTING

Concealed fluorescent lighting illuminates the layout tables at the Capital Electric Company in Madison, Wisconsin. Desk height and at a slight angle from horizontal, the layout tables are lined up along one side of the office.

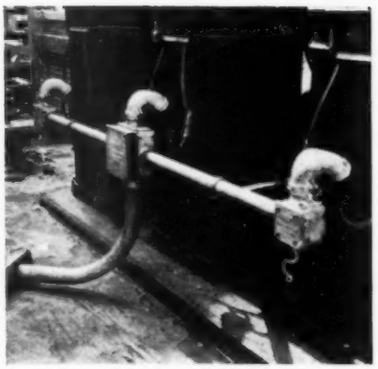
An 8-in. wide shelf is mounted on the wall 18-in. above the tables. A single

SHELF AND TRIM *above layout tables conceal efficient fluorescent lighting*

row of fluorescent tubes mounted end to end are installed on the underside of the shelf. A 4-in. trim extending down from the edge of the shelf conceals the lamps and cuts off the angle of illumination at approximately the outer edge of the table. Pull-chain switches extending through the trim control the lamps.

TRANSFORMER RACK

The secondary circuit for a bank of three oil cooled power transformers on the roof of a pump house in an oil cracking plant is run entirely in conduit. The installation, made by the M. W. Kellogg Co., oil refinery contractors and engineers of New York, consists of a T shaped conduit arrangement with three cast boxes and service heads.



OUTDOOR RACK *for transformer secondaries uses a single conduit line with square gasketed cast boxes and service fittings.*

The largest fitting is mounted on the end of a 3½-inch sweep ell which connects to the secondary switch on the roof. One 2-inch conduit extends from each side of this box to a smaller box centered in front of the end transformers. A service fitting with a two hole cover is mounted on the top of each of these connection boxes. The conduit arms are supported by a triangular bracket made of angle iron and welded to one of the I beams supporting the transformers.

The star or delta transformer connections are made in the conduit fittings, eliminating the necessity of a secondary rack with insulated supports. If changes in transformer sizes are made or rack extensions are necessary, the same fittings can be used with new end plates containing the correct conduit hub sizes.

MECHANICS TABLE

The mechanics of George J. Martin & Son, electrical contractors of Albany, N. Y., have their own table for making out their material and time sheets.

It is located in the company's stock room and contains drawers with all the necessary forms. A mechanical pencil

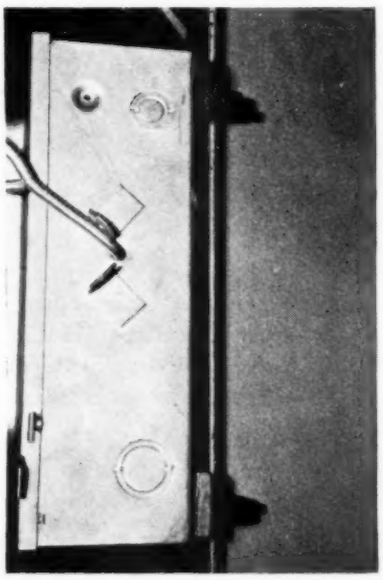
MECHANICS BOOKKEEPING *and plan studying is done on this table reserved for this purpose in the stockroom. Interference in main office is eliminated.*

on a weighted bead chain is handy for those men who always seem to lose their pencils.

DISCONNECT SWITCH MOUNTING

The Garden Electric Company, Inc., Elizabeth, N. J., is standardizing more and more on the use of clamps of various types to mount all electrical equipment on steel. In addition to eliminating drilling of the customer's steel work, it affects a considerable saving in labor.

The disconnect switch shown below is mounted to the flange of an I beam with four 90 degree set screw clamps. Both sides of the clamp are drilled and tapped for the switch mounting screws,



CLAMP MOUNTING *of this disconnect switch is accomplished by the use of four right angle set screw clamps, providing a substantial yet inexpensive support.*

WIRING Methods

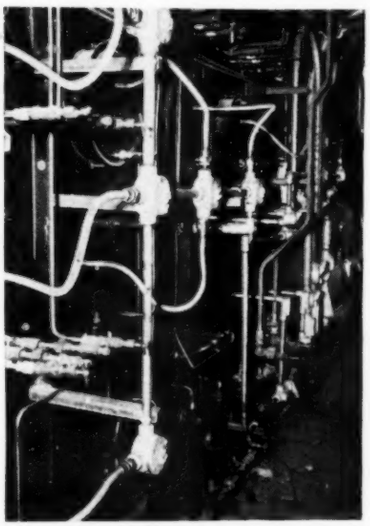
[FROM PAGE 24]

making it possible to mount the switch either on the flange or parallel to the web of the beam. In this particular case, the switch was wider than the flange of the beam, so flat iron cross pieces cut the exact width of the switch were mounted to the clamps. The switch was then mounted to these cross pieces.

This method provides a quick, solid mounting which can easily be taken down for removal to another part of the plant.

EXPLOSION-PROOF CONNECTIONS

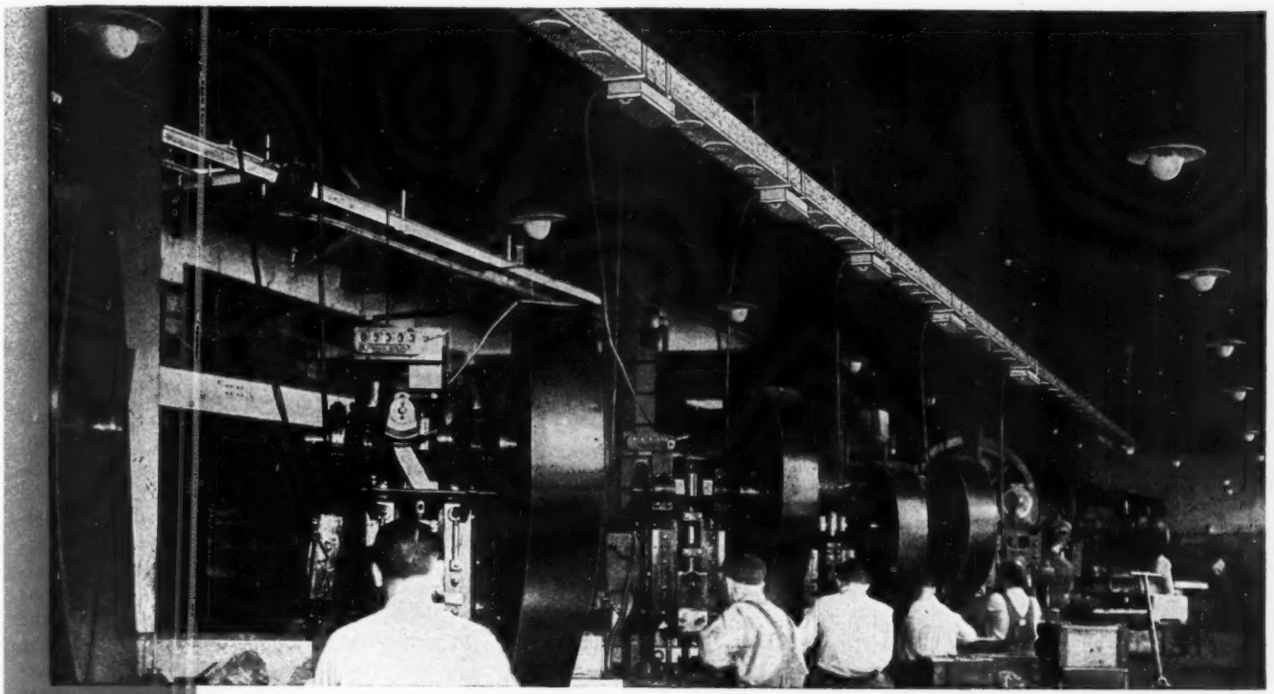
Electrical connections on meter boards must be explosion-proof as well as motor terminal and switch connections in a hazardous location. The M. W. Kellogg Co., oil refinery contractors and engineers of New York, used explosion-proof flexible tubing for



***METER CONNECTIONS** in hazardous locations are made with explosion-proof flexible conduit terminating in approved fittings.*

meter connections on this control board installed in a New Jersey oil plant.

The wiring behind this board is run in conduit with explosion-proof conduit fittings used as terminal and splice boxes. Extensions from these boxes to the meter terminals are made with heavy explosion-proof flexible metallic conduit or tubing. All conduit and tubing connections are threaded. Wherever conduit enters a switch, control or fuse enclosure or any enclosure where a spark might occur, conduit sealing fittings are used.



Move the machine—plug in—*go!*

It's as simple as that when the plant is equipped with Plugin (FA) Busducts. The easily-accessible outlets, conveniently spaced, make it possible to place machines at any desired location—to plug in quickly—and to commence operation without delay. With Plugin (FA) Busducts, use Feeder (FA) Busduct to provide ample capacity for present and future power requirements.

THE DEFENSE JOB—

YOU—

and the

FRANK ADAM ELECTRIC CO.

Speed and efficiency will be required of you on your share of the defense job. Expert advice will be needed on your electrical installations for both power and light. . . . Centrally located, with a highly trained engineering organization in strategically located cities, the Frank Adam Electric Company is ready to consult with you, and to make quick deliveries in this emergency. You can rely on prompt and complete service, not only on (FA) Busducts, but on other trouble-free (FA) products — such as

Shutlbrak Safety Switches . . . Power and Light Distribution Panelboards (Standard and Column Types) . . . Klampswitchfuz Narrow Distribution Panelboards (for floor and wall mounting) . . . and many others.

This is the *Modern* Way!

This is the compact, flexible and convenient method for power and light distribution. The busducts may be attached to either walls or ceilings. Flexibility is provided by suitable elbows, tees, end boxes, intermediate feed-in and feed-out boxes—all adapted to fit required space or position. Future extensions may be made readily to existing installations.

(FA) Busducts—both Feeder and Plugin types—are made in standard 10-foot sections. Each section of the Plugin type is arranged with nine plug-in outlets on 12-inch centers. The copper bus bars (contained in enclosures of galvanized steel or aluminum) are rigidly supported at 30-inch intervals by specially designed insulators that assure proper spacing—to meet requirements of the National Electrical Code. Contact surfaces of connecting bars are silver-plated, to prevent oxidation. For 2, 3 and 4-wire feeder systems; 250 volt DC, 575 volt AC, maximum.

(FA) Sales-Engineers Can Help Manufacturers, Architects, Engineers and Contractors With Their Distribution Problems

Their long experience and training are at your service—without obligation. Write for the name and address of the one nearest you. Also, for Bulletin 61, which contains complete descriptions, applications and detail drawings of (FA) Busducts. . . . Frank Adam Electric Company, St. Louis, Mo.

EST. 1891 THE SIGN OF A BETTER JOB

FA

Frank Adam

ELECTRICAL PRODUCTS

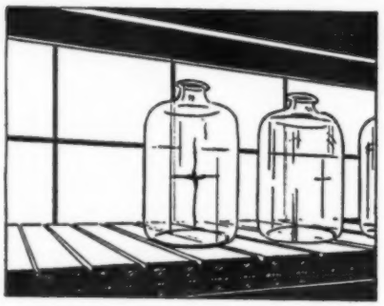
for Industry

FRANK ADAM ELECTRIC CO. ST. LOUIS, MO. U.S.A.

Better Lighting

REFRACTION

Transparent materials such as plate glass, bottles, bulbs, clear plastics, etc., will reveal bubbles, blisters, cracks, chips and whorls by high lights or distortions. Alternating the observation between

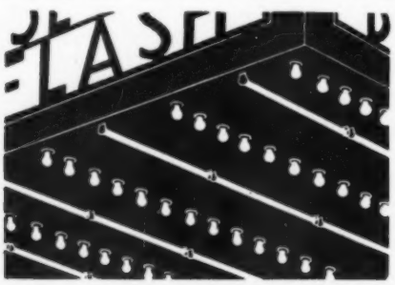


dark and luminous backgrounds introduces movement which aids in locating and identifying defects.

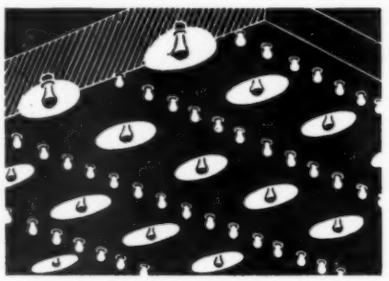
Similarly, surface distortions and irregularities in polished sheet metal are revealed by the distortion of reflected images of straight lined bars or strips laid on the luminous background.

SIX WAYS TO LIGHT MARQUEES

The marquee and attraction signs have become the familiar badge of the theatre. The extended, brightly lighted areas of the newer forms of luminous marquee treatment give them a value much greater than that of older forms.



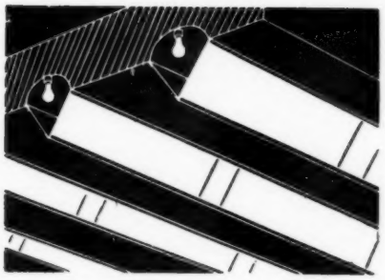
ONE—Alternate rows of A-bulb and mazda lumiline lamps.



TWO—Combination of exposed bulbs and flush-mounted reflector units

Marquee signs should bulletin attractions dominantly and legibly not alone to sidewalk traffic but to vehicular traffic as well. In this respect some projection of the display is of major concern. On smaller buildings or narrow streets not allowing large marquee structure, this is achieved by the triangular-shaped design now available in factory-fabricated units.

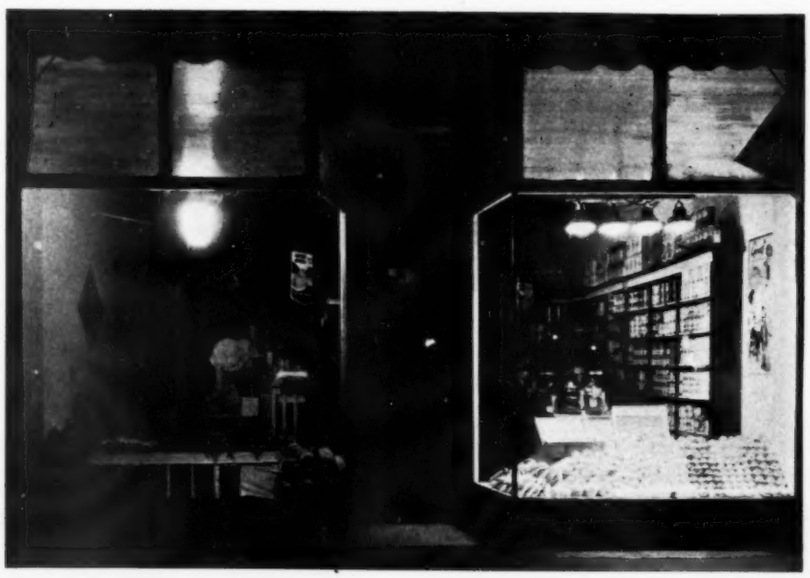
Luminous backgrounds for silhouette



THREE—Recessed trough cavity with V-shape translucent elements.

changeable copy may be either open cavity or glass faced. The principal lighting requirement is uniformity of brightness and elimination of spottiness. This makes for legibility and quick reading; spottiness causes variable irradiation which blurs or distorts the outlines of the silhouette letters. The brightness of the luminous background should be regulated by the general street illumination and the brightness of competing displays. Exposed lamp signs, particularly those employing reflectors may best be used where the values of dominance and attention are demanded.

The most obvious, the simplest, and often the best method of lighting the underside of the marquee is to ceil it with low-wattage exposed lamps. The purpose they serve, logically, is creating a festive spirit by their sparkle and brightness. Some systematic arrangement or geometric pattern of lamps is desirable. Such a pattern aims particularly to be pleasing, coupled perhaps with a motif directing attention toward the entrance. Sometimes, the principal



SELLING BY DEMONSTRATION—The lefthand window, equipped with a prismatically enclosed unit, has less than one footcandle of intensity on the merchandise. In the righthand window, a portable bank of four 150-watt lamps in window reflectors produce an average of 83 footcandles. This effective demonstration suggests another way in which the electrical contractor can boost his sales.

Day Brite FLUORESCENT LIGHTING

Gives that added Punch in "Lighting for Sales"

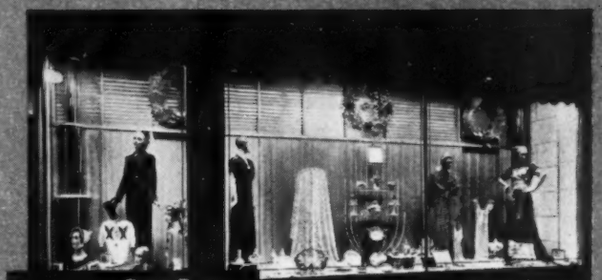
Nine times out of ten, fluorescent lighting goes into a merchant's store because that merchant knows that when Mrs. Public goes shopping his livelihood depends on her buying.

Naturally, Mrs. Public's attention turns first to well lighted show windows. The merchandise displayed in such windows gets her attention and holds it. An abundance of soft glareless light warms her interest rapidly — encourages her to step inside. Then the right kind of fluorescent general lighting imparts a clean, cheerful appearance to the entire interior of the store and invites her to look around. The final touch is the color and life in the merchandise displayed in correctly lighted show cases and wall cases that changes interest to desire — the desire to buy.

The wide-awake electrical contractors who are reaping the rich rewards of modern fluorescent lighting are showing a decided preference for Day-Brite fluorescent fixtures, not only because Day-Brite is a pioneer in the fluorescent field, but because Day-Brite provides the most complete and dependable line of correctly engineered fluorescent lighting fixtures for every application.

Day Brite LIGHTING, INC.

5430 Bulwer Ave., St. Louis, Missouri



Fluorescent Show Window Lighting

Fluorescent Display Case Lighting

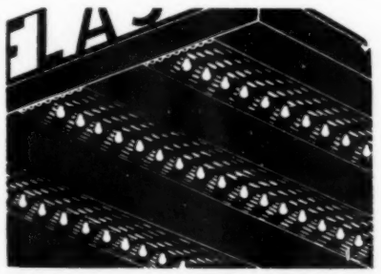
Above: Paralumes—Direct Mounting
Left: Paralumes—Suspension Mounting

Sell Day-Brite for complete store installations . . . for show windows . . . for general interior lighting and for all branches of display lighting and assure your customers of the satisfaction of having the very best. Day-Brite is the recognized leader in the fluorescent field.

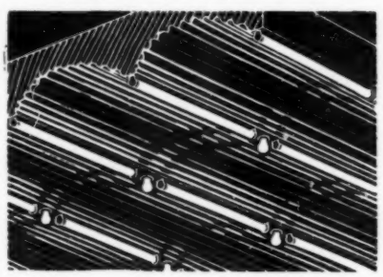
Better Lighting

[FROM PAGE 28]

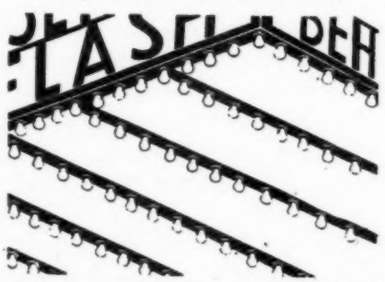
sign border is carried with flowing motion effect right down to the ticket booth. An arrangement of symmetrical studding of regular inside-frosted bulbs combined with lines of light from Lumiline lamps is very effective. Maintenance is simplified and additional sparkle is obtained by using



FOUR—Flat corrugated polished metal backgrounds for exposed lamps.



FIVE—Curved corrugated polished metal ceiling with mazda lumiline lamps.



SIX—Large translucent panels bordered with exposed mazda lamps.

enameled metal in white or light tint.

Other possibilities are the use of flush-mounted reflector units with silvered-bowl lamps for high-level lighting beneath the marquee, combined with lines of exposed bulbs on 6-inch to 8-inch spacing to introduce brightness when viewed from down the street. In some instances the entire underside of the marquee has consisted of a large luminous glass panel; but often this does not present sufficient brightness unless combined with exposed lamps either as a soffit edging or by the abundant use of exposed lamps in the vertical sign and attraction sign borders.

HEADQUARTERS for LIGHTING

AT THE SIGN READING . . .

Westinghouse

NOW . . . when time is at a premium . . . 117 local Distributors offer individualized engineering counsel and complete lighting equipment stocks.

WESTINGHOUSE SUPPLIES THE ANSWER

Providing highly specialized engineering services, improved products and a wealth of lighting experience, Westinghouse is daily helping hundreds of American Industries to speed up production . . . protect plants and property . . . insure better products.

Why not shift this burden of individualized engineering counsel to Westinghouse? This service is always available to you . . . to help you prepare sound lighting recommendations . . . quickly and with the least amount of effort.

Westinghouse offers interior lighting equipment and floodlighting for every commercial and industrial need. These highly-flexible lines include quality-proved fluorescent . . . incandescent . . . and high intensity mercury fixtures. Whatever your customers' lighting requirements may be, there is a Westinghouse product and a Westinghouse plan to improve factory and office illumination.

Start saving valuable time for you and your customers today . . . consult your nearest Westinghouse Lighting Distributor, or write for "Descriptive Data Kit"—Department H, Lighting Division, Westinghouse Electric & Mfg. Co., Edgewater Park, Cleveland, Ohio.

TUNE IN "MUSICAL AMERICANA," N. B. C. RED NETWORK, COAST-TO-COAST, EVERY THURSDAY EVENING.

Westinghouse Lighting Equipment

And Now Electric Heat

[FROM PAGE 14]

Once the size, type and number of heaters has been determined, they must be located. This is of paramount importance. Heaters improperly located with reference to windows, doors, or each other may vitally impair operating results. Generally speaking they should be installed on outside walls near the points of greatest cold air infiltration.

In most communities each heater must be separately protected at the panel. However a few local codes in the Southwest permit multiple installation up to 35 or even 50 amperes per terminal, if conductor size is maintained through to the last heater. Heaters of less than 2000-watts may be either 115- or 230-volts. All heaters 2000-watts and over are wound for 230-volts only. Demand factors are gradually becoming more liberal ranging from 100 per cent for 1-2 heaters, through 70 per cent for 6-10 units down to 40 per cent where 36 to 60 heaters occur on one meter.

Installation costs average in the neighborhood of $20 per kw. of connected heater load throughout most of southern California. As an illustration of how much the ordinary bungalow wiring job is increased when space heating is added, note these figures:

1. Assume there are a total of 35 outlets of all classes in the non-all-electric job. This will sell competitively for $75.00, with service and door bells.

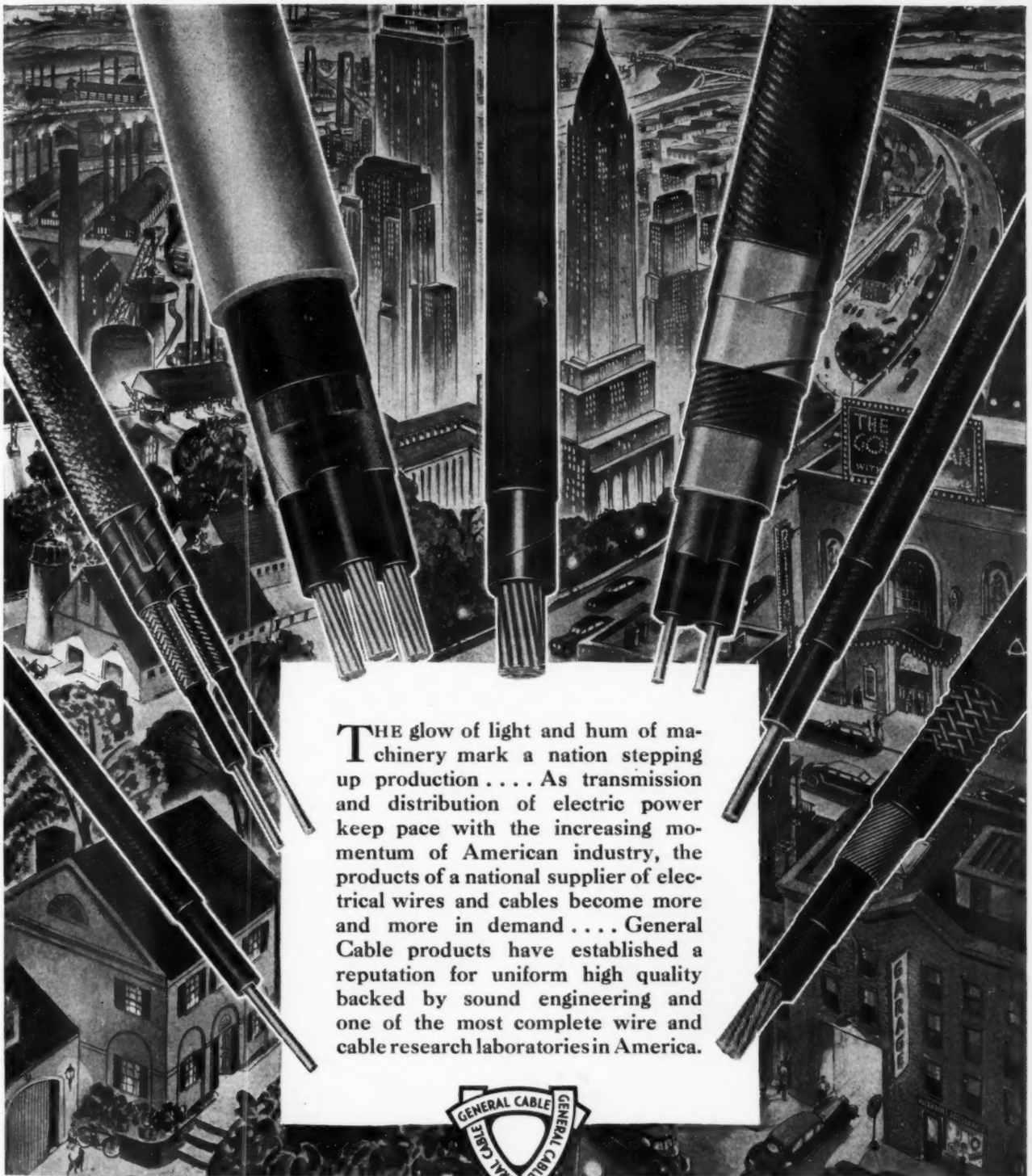
2. Complete space heating for this house will require about 15 kw. which at $20 per kw. for heaters, wiring and increased service facilities, totals $300.

3. Adding the original $75, we find the job has jumped to $375.

4. Often when it is not possible to sell a complete installation, a 1650- or 2000-watt heater of the type shown can be added at from $20 to $30 depending on conditions. This alone boosts the original job from $75 to $100 or more.

Hence the term "plus business" used above. An important fact not to be overlooked is that when you sell electric heaters on the job you do not greatly increase the overall building cost. You are merely inducing the owner to spend his heating dollar, or part of it at least, with you instead of with the heating contractor or plumber—a much easier task than selling the job "straight up" for even a fraction of the amount.

Far sighted individuals in the contracting field are rapidly coming to recognize the possibilities of electric space heating and are qualifying themselves to assume leadership in their respective communities.



THE glow of light and hum of machinery mark a nation stepping up production . . . . As transmission and distribution of electric power keep pace with the increasing momentum of American industry, the products of a national supplier of electrical wires and cables become more and more in demand . . . . General Cable products have established a reputation for uniform high quality backed by sound engineering and one of the most complete wire and cable research laboratories in America.

GENERAL CABLE

BARE and INSULATED WIRES and CABLES for EVERY ELECTRICAL PURPOSE

Stocked by Electrical Wholesalers Everywhere

General Cable Corporation Sales Offices: ATLANTA • BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DETROIT
KANSAS CITY (MO.) • LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH • ROME (N.Y.) • ST. LOUIS • SAN FRANCISCO • SEATTLE • WASHINGTON (D.C.)

ALL Units Interchangeable

HERE are the makings of any single or multiple-gang Wiring Devices the job requires. Any arrangement or combination of Switches, Receptacles, Radio Outlets, Pilot Lights or Night Lights *to ensure ADEQUATE wiring.*

The Units are quickly assembled by attaching to metal yoke supplied with each plate. They are fastened—rigidly and permanently—by the mere twist of a screwdriver.

Interchangeable Units make your *stock* more flexible:—cover your needs with a *smaller inventory* by their greater adaptability.

Styled in white IVORYLITE and brown BAKELITE, with Plates of "UNILINE" design matching other standard makes. Our Catalog lists *all* the Interchangeable Units from which to make up your assortment; write if you haven't a copy.

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THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.

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ELECTRICAL CONTRACTING

McGRAW-HILL PUBLISHING CO.

330 WEST 42nd STREET

NEW YORK, N. Y.

Industrial Electrification and MAINTENANCE

MAINTAINING POWER FACTOR

AS time goes on, electrical men learn more about the mystery of electricity, its generation, distribution and its ultimate transformation into mechanical energy. Better methods are being evolved to handle this phantom that scurries from generators, over miles of conductors and finally enters plants to turn the wheels of industry.

In line with this progress is the continuous increase of production efficiencies and reduced unit costs. For, in this day and age, industry gives no quarter to waste. And after all the other "bugs" in the production processes are ironed out, attention is turned to methods of reducing electrical energy costs.

In last month's article, the causes and effects of low power factor were discussed. The resultant low operating efficiencies of electrical equipment and the electrical system as a whole were pointed out. And this means wasted energy. Careful study of the local power company rate schedule will show, in addition to charges for the energy registered at the meter, that penalties are imposed for low power factor conditions.

Now, reduction of power costs is the plant engineer or maintenance man's responsibility. It is up to him to discover costly power "leaks." And poor power factor constitutes a big leak. What can be done to improve this and how can it be maintained? Here is the how and why of power factor correction.

Previous articles covered—

1. Simplifying Electrical Maintenance
2. Preventive Maintenance of Distribution Systems
3. Preventive Maintenance of Electrical Equipment
4. Reducing Power Costs
5. Maintaining Good Power Factor —Part I
6. Maintaining Good Power Factor—Part II (this issue)

Future articles will discuss—

7. Meeting Severe Service Conditions.
8. Safety Protection for Electrical Operations
9. Increasing Flexibility of Electrical Service
10. Providing Adequate Capacity for Increased Demand
11. Extending Automatic Control
12. Electrifying Operations to Reduce Unit Costs
13. Methods for Handling Changeovers and Live Circuits

MAINTAINING GOOD POWER FACTOR

PART II—How Power Factor can be Improved and Maintained

POWER factor being an intangible "something" is too often looked upon as a mystery. But it is a condition that exists on alternating current circuits and results from perfectly normal causes. It must be understood and dealt with. The "mystery" was explained, and causes and effects of low lagging power factor were discussed in this department in last month's issue of ELECTRICAL CONTRACTING. Continuing the discussion of general subject, we present here various methods for improving and maintaining power factor, and show the kind of results that can be obtained.

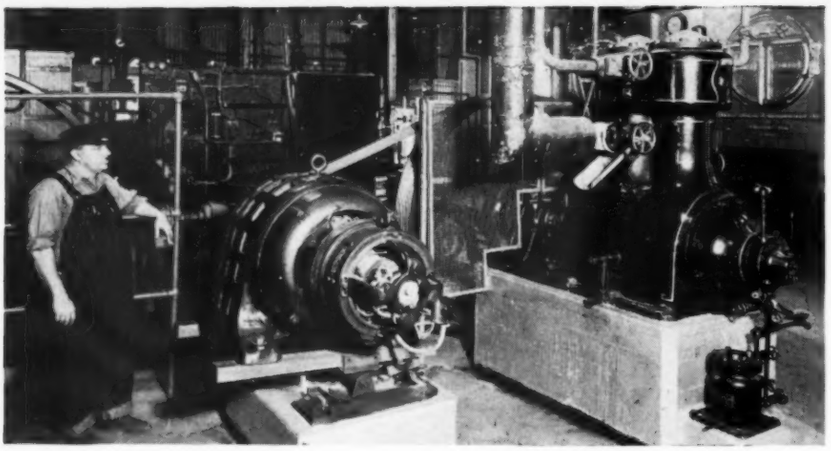
1. Study Rate Schedule

An important reason for improving power factor is to reduce power costs. So the first step is to make a study of the local power companies' rate schedule. Billing for electric power is usually made on both energy (kwhr) and demand (kw) requirements, according to the plant's power factor, and adjusted to basic lagging power factor which is stated in the rate schedule.

The plant's power factor is determined by special tests, or by a reactive-component volt-ampere-hour (kvarh) meter used in connection with a watthour (kwhr) meter. The kvarh meter measures the total or "apparent" power consumed.

A great number of rate schedules include a clause requiring that the user maintain power factor at a stated value (usually 85 percent) and that the demand or consumption be adjusted for that value. If the power factor (averaged or for a specified period) is lower or higher than the stated amount, another clause provides for a penalty and in some cases a bonus, respectively. When low power factor prevails, the user pays for the power at the meter, in addition to a penalty, and so gets useful work out of only part of the power.

***PERIODIC TESTS** for power factor of individual machines and entire plant enables the electrical maintenance man to avoid overloading and to reduce power losses in the distribution system.*



***POWER FACTOR ANALYSIS** in plant of Luer Packing Co., Inc. Vernon, Calif. showed that power factor and efficiency savings of 33⅓% per year of original investment could be made by raising plant power factor from 72% to 95% average. A 50-hp induction motor belted to ammonia compressor operating 24 hrs. per day was replaced with a 50 hp, 70% leading p.f. synchronous motor, resulting in savings of over $500 per year. When plant expansion was made, another synchronous motor, 125-hp, 80% leading p.f., was installed on new ammonia compressor, resulting in a total average power factor savings of $95 per month. (Fairbanks, Morse & Co. photo)*

2. Improving Power Factor

Correcting power factor and maintaining it in its improved state is an individual problem for each plant. Three general methods for improving plant power factor are:

(A) Most important—eliminate unnecessary reactive current from the circuit by the proper application and the use of proper sizes of motors.

(B) Prevent and compensate for lagging power factor or draw a leading reactive current from the line by using synchronous machines.

(C) Correct and compensate for lagging reactive current by use of neutralizing capacitance, which can be done by installing capacitors.

More specific methods by which power factor can be improved are:

(*a*) *Replace underloaded motors* with smaller motors which are capable of carrying the load. But this must not be carried to an extreme condition of using motors too small for the load because other serious effects (both mechanical and electrical) and shutdowns will occur which may be more expensive than operating at low power factor. Properly applied, however, this replacement results in less reactive current in the supply lines. Magnetizing current is comparatively less for a small motor than for a motor of higher horsepower rating and same speed.

(*b*) *Replace incorrectly applied motors* with the proper type. An examination of all plant drives may reveal opportunities for the elimination of incorrect types of motors. An example is cited of a press with a flywheel which is an inertia load. The machine was furnished with a 100-hp, 5 percent slip motor, but a study showed that a 25-hp, 12 percent slip motor could be used.

(*c*) *Use high-speed induction motors.* As high-speed motors have less number of poles, they have less magnetizing current and higher power factor than motors of lower speeds. A study of the drives may show that a standard squirrel-cage motor of higher speed (consistent for the drive) for belt or chain drive, or with a built-in gear (gearmotor), a separate gear, or a speed reducer would be suitable.

Another possibility might be a squirrel-cage high-speed motor with an adjustable-speed device to replace a wound-rotor motor operating at reduced speeds.

(*d*) *Replace underloaded transformers* with smaller sizes suitable for the load; also disconnect from the line any transformers that have no secondary load.

(*e*) *Use synchronous motors* for continuous-duty constant-speed drives, where the load is 25 hp. or over. These motors can be designed for full-load operation at unity or 0.9, 0.8, and other leading power factors.

The d-c field current is usually held at a constant value for rated load and power factor. If under these operating conditions the load decreases, the amount of leading reactive kva for improving power factor is greater than at full load.

Where low-speed motors are required, such as direct-drive for compressors and pumps, the use of synchronous motors instead of induction motors eliminates the large lagging reactive kva of the low-speed induction motor.

In addition, the inherent characteristics of synchronous motors tend to maintain a constant voltage where the line voltage varies. The leading reactive kva decreases under conditions of high voltage, and increases under conditions of low-voltage, within reasonable limits.

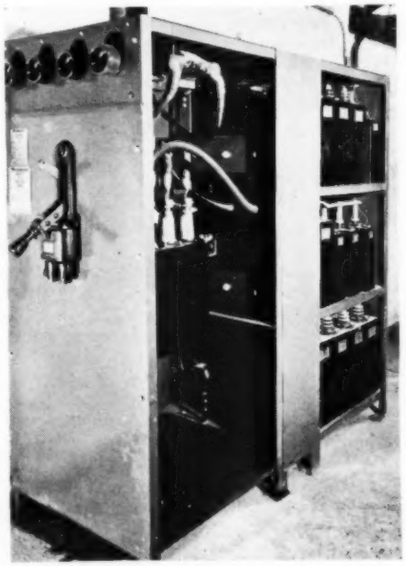
Tables and examples for correcting power factor by the use of synchronous motors are given in the accompanying Maintenance Guide Sheet.

(*f*) *Other synchronous machines.* Synchronous converters are used where direct current is required for apparatus or processes. By operating with slightly over-excited fields only at partial load, the power factor of the system can be improved this way also.

Synchronous induction motors, such as the Fynn-Weischel motor which is the type used most commonly in this country, operate as a synchronous motor up to about 50 per cent overload, at which point they pull out of synchronism and operate as induction motors. When the overload is reduced, the motor pulls into synchronism again and operates as a synchronous motor.

Synchronous condensers draw a leading current from the line and supply magnetizing current for other induction apparatus on the line. They are used where a large amount of corrective reactive kva is required. They float on the line and do not carry mechanical load.

(*g*) *Install capacitors.* This type of equipment, a static device, draws a leading reactive current, provides a local source of magnetizing current for inductive equipment, and when connected at or near the terminals of the induction apparatus, corrects power factor by eliminating lagging reactive currents from the branch circuit and feeder. The reactive current continues to flow only between capacitor and induction equipment.



***INDUCTIVE LOAD** of approximately 1,100 motors on mill drives was lowered and feeder currents were substantially reduced by the installation of 1,560 kva of capacitors at Bigelow-Sanford Carpet Co., Amsterdam, N. Y. Plant power factor was corrected from 80 to 95%. Feeder capacity has been increased 18%. Monthly saving in power bill is 6%, by reducing demand charge. Expressed as a percentage of first cost of capacitors, annual saving approximates 30%. One of 12 banks of capacitors is shown in illustration. (Westinghouse photo)*

MAINTENANCE GUIDE SHEET

LEADING OR LAGGING REACTIVE KVA. PER KW. LOAD AT VARIOUS POWER FACTORS

P.F.	Reactive Kva.	P.F.	Reactive Kva.	P.F.	Reactive Kva.
Cosines and Tangents					
Cos.	Tan.	Cos.	Tan.	Cos.	Tan.
1.00	0.0000	0.80	0.7500	0.60	1.3333
0.99	0.1423	0.79	0.7761	0.59	1.3684
0.98	0.2030	0.78	0.8023	0.58	1.4045
0.97	0.2507	0.77	0.8287	0.57	1.4415
0.96	0.2916	0.76	0.8551	0.56	1.4792
0.95	0.3288	0.75	0.8819	0.55	1.5185
0.94	0.3630	0.74	0.9089	0.54	1.5587
0.93	0.3953	0.73	0.9363	0.53	1.6000
0.92	0.4258	0.72	0.9637	0.52	1.6426
0.91	0.4557	0.71	0.9919	0.51	1.6864
0.90	0.4883	0.70	1.0203	0.50	1.7321
0.89	0.5123	0.69	1.0489	0.49	1.7791
0.88	0.5398	0.68	1.0783	0.48	1.8275
0.87	0.5667	0.67	1.1080	0.47	1.8780
0.86	0.5934	0.66	1.1383	0.46	1.9302
0.85	0.6196	0.65	1.1692	0.45	1.9845
0.84	0.6459	0.64	1.2005	0.44	2.0407
0.83	0.6720	0.63	1.2327	0.43	2.0995
0.82	0.6980	0.62	1.2655	0.42	2.1609
0.81	0.7239	0.61	1.2989	0.41	2.2245

POWER FACTOR CORRECTION WITH SYNCHRONOUS MOTORS

Relationship Of Various Factors

When referring to a vector diagram or right angle triangle, let the base of the triangle represent active power (kw.), the perpendicular side represent reactive power (kvar.), the hypotenuse represent apparent power (kva.), and the angle Θ, opposite the perpendicular side, represent the electrical degrees of phase displacement. Then,

$$\text{Power factor} = \frac{\text{active power}}{\text{apparent power}} = \frac{\text{kw.}}{\text{kva.}} = \cos\Theta$$

$$\text{Active power} = \sqrt{\text{kva.}^2 - \text{kvar.}^2} = \text{kva.} \times \cos\Theta$$

$$\text{Apparent power} = \sqrt{\text{kw.}^2 + \text{kvar.}^2} = \text{kw.}/\cos\Theta$$

$$\text{Reactive power} = \sqrt{\text{kva.}^2 - \text{kw.}^2} = \text{kw.} \times \tan\Theta$$

For each power factor there is a definite relation between active power and reactive power. This relation is expressed by factors which are listed in the accompanying table.

To Improve Power Factor without Increasing the Kw. Load

EXAMPLE (A): Assume a plant load of 200 kw. at 70% power factor. It is desired to raise the power factor to 95% by substituting a 0.8 leading p.f. synchronous motor for some of the induction motors without increasing the plant kw. load.

From table—for each kw. input to the induction motors at 0.7 p.f., the lagging reactive kva. is 1.02. Likewise, for each kw. input to the 0.8 p.f. synchronous motor, the leading reactive kva. is 0.75. Therefore, each kw. of leading 0.8 p.f. synchronous motor load which replaces a kw. of lagging 0.7 p.f. induction motor load, first eliminates 1.02 lagging kva. and, in addition, neutralizes 0.75 lagging reactive kva. Hence, each kw. of 0.8 p.f. synchronous motor load reduces the lagging reactive kva. a total of:

$$1.02 + 0.75 = 1.77 \text{ kva.}$$

Using the factor 0.691 (see table in Maintenance Guide Sheet, Electrical Contracting, Dec. 1939) to increase the power factor from 0.7 to 0.95, the reduction in the reactive kva is:

$$200 \times 0.691 = 138.2 \text{ reactive kva required.}$$

Therefore, the total kw. synchronous motor load required is: $\frac{138.2}{1.77} = 78$ kw. input at 0.8 leading p.f.

FURTHER, assume an average motor efficiency of 92% then the hp. rating of the 0.8 p.f. synchronous motor required is: $\frac{78 \text{ kw.} \times 1000 \times 0.92 \text{ eff.}}{746} = 96$ hp.

Consequently a 100-hp. 0.8 p.f. synchronous motor (next larger standard hp. rating) should be used to replace induction motors which are delivering 100 brake hp.

The kw. load has remained the same, but the original kva. load on the plant has been decreased from

$$\frac{200}{0.70} = 286 \text{ kva., to } \frac{200}{0.95} = 210 \text{ kva.}$$

To Improve Power Factor when Kw. Load is Increased

EXAMPLE (B): Assume a plant having an original average load of 800 kw. at 75% power factor, to which it becomes necessary to add a 150-hp. 720-rpm. motor.

$$\text{Original kva. of plant} = \frac{\text{kw.}}{\text{p.f.}} = \frac{800}{0.75} = 1066.6 \text{ kva.}$$

Original reactive kva. of plant is:

$$\text{Reactive kva.} = \text{kw.} \times \tan\Theta$$

From above table, tan Θ for a 0.75 power factor = 0.8819. Therefore, original reactive kva. = $800 \times 0.8819 = 705$ lagging reactive kva.

By adding a 150-hp., 1.0 p.f. motor, 90% efficiency, the reactive kva. of the plant remains the same (705 kva.) because the 1.0 p.f. synchronous motor has no reactive kva., either leading or lagging.

$$\text{Kw. load added} = \frac{150 \text{ hp.} \times 0.746}{0.90 \text{ eff.}} = 125 \text{ kw.}$$

Total plant kw. load = 800 + 125= 925 kw.

Resultant power factor is the cosine of the angle whose tangent is: $\frac{705 \text{ kva.}}{925 \text{ kw.}} = 0.763$

From above table, the cosine of this angle whose tangent is 0.763, is 0.79, therefore, the final power factor is 0.79 or 79% p.f. approximately.

Actual kva. load on the plant is now:

$$\frac{925 \text{ kw.}}{0.79 \text{ p.f.}} = 1172 \text{ kva.}$$

EXAMPLE (C): Assume same conditions as for Example (B), except that an 0.8 leading p.f. synchronous motor is added.

Leading reactive kva. of this motor as taken from table is 0.75 per kw. or $125 \times 0.75 = 93.75$ leading reactive kva. This is to be subtracted from the original 705 lagging reactive kva. as it neutralizes 93.75 lagging reactive kva., consequently the reactive kva. after adding this leading power factor motor is:

$$705 - 93.75 = 611.25 \text{ final reactive kva.}$$

Final power factor is the cosine of the angle whose tangent is: $\frac{611.25 \text{ kva.}}{925 \text{ kw.}} = 0.65$

or, as taken from above table, approximately 84%.

Actual final kva. load is: $\frac{925 \text{ kw.}}{0.84 \text{ p.f.}} = 1100$ kva.

Courtesy of Fairbanks, Morse & Co.

WITH RAPID EXPANSION *and additional motor load, the California Milling Corp. of Los Angeles found the total input plant kva beyond the capacity of the main oil circuit breaker. Cost of a larger breaker installation would exceed $1,000 with no reduction in power cost. However, by replacing two 100-hp and one 75-hp, 8-pole, continuously operating squirrel-cage motors, with two 100-hp, 70 per cent leading power factor Fairbanks-Morse synchronous motors, the plant kva was reduced within the limit of the oil circuit breaker. In addition, the plant power factor was improved from 64 per cent to almost unity, effecting a power factor rebate which has averaged $1,265 per year since the installation in 1932. This saving was augmented by the better over-all operating efficiencies of the synchronous motors. Also, the maintenance of synchronous speeds on the mills resulted in more uniform products. Total yearly savings represent a return of more than 30 per cent on the original investment.*

Corrective equipment corrects power-factor from the point of connection on the line back to the generator. Capacitors are connected (*a*) to the main bus at the switchboard to correct the over-all plant power factor, (*b*) at distribution or small load centers for correction on feeders, (*c*) near or directly at the terminals of the apparatus or device, such as motors and fluorescent lamps, to correct low power factor at the source. They are available for indoor and outdoor use and, having no moving parts, require practically no maintenance.

A table for correcting power factor by the use of capacitors was given in the Maintenance Guide Sheet in the last issue of ELECTRICAL CONTRACTING.

(*h*) *Rewire a.c. feeder circuits* of large circular mil conductors run in air. Large conductors have poor inherent power factor. To minimize this condition, it is a good rule to use cable not larger than 500,000 cir mils for circuits of 600 volts or less. As many smaller cables as necessary per phase must be used to carry the load. For further details see "Figuring Voltage Drop" by A. B. Smedley, in ELECTRICAL CONTRACTING, May 1940.

Have a good power factor but avoid being overzealous. Some maintenance men go to the expense to improve the plant power factor to 100 per cent. In many cases cost of corrective equipment is proportionally higher to improve the power factor to 100 per cent than to 85 or up to 90 per cent. The lower the power factor, the greater is the need for each per cent of improvement. It is more important to raise a low plant power factor 5 per cent than to raise from 90 to 100 per cent.

3. Benefits Derived

But by maintaining good power factor, the maintenance man can produce results which will be beneficial from an economical and an operating standpoint. Some of the principle results that can be obtained are:

(A) Lower investment in operating equipment by using (*a*) high-speed induction motors which, being smaller in physical size, cost less per horsepower; (*b*) correct size of transformers, circuit breakers and other equipment rather than oversized which has a greater initial cost.

(B) Reduced power costs (*a*) by using equipment of proper capacity thus having a lower kw demand and consequently lower demand charge; and (*b*) by reduced power losses in the distribution system.

(C) Minimum interruptions from (*a*) failure of power service caused by overload, circuit fuses blowing and relays tripping; (*b*) motor burnouts.

(D) Reflection in increased plant production by having a comparatively constant voltage and no interruptions in power supply.

(E) Ability of power-consuming equipment to operate at rated voltage and consequently high efficiency. Full line voltage is applied at equipment terminals when internal resistance drop in the supply circuit is a minimum for normal current.

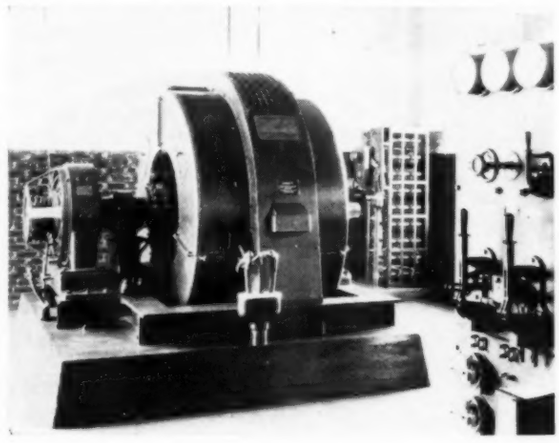
(F) Reduction in load on feeders, transformers and circuit breakers, without reducing connected horsepower load. When magnetizing current is reduced, power consuming equipment need not be disconnected to lower the load on the system.

(G) Additional load can be carried by distribution system without increasing capacity of conductors and transformers. If the load is normal for the connected equipment and the distribution system has been properly designed to provide for future requirements, the load can be increased up to the allowable capacity of the system. In other words, an improvement in power factor has a result which, in effect, is comparable to increasing the capacity of the wiring and other distribution equipment.

(H) Better voltage regulation at load centers because of less current flowing, less IR drop in the lines, and the generator and voltage regulator being able to function properly.

(I) Reduction in power losses in circuits and other distribution equipment. Power loss is directly proportional to the square of the current, consequently the lower the current, the lower the power loss.

(J) Reduction in power rate often obtainable by ability of the utility company to lower its equipment investment.



SYNCHRONOUS CONDENSER *rated 2,000 kva., 900 rpm, 2,300 volts, 60 cycles, was installed in a Pennsylvania colliery with a number of induction motors driving a belt conveyor. Power factor improvement resulted in savings in the first year representing about 50 per cent of the installed cost of the condenser. (Gen. Elec. Co. photo)*

"3C" BULLETIN 100 TYPE "D" HEAVY DUTY PUSH BUTTONS OIL IMMERSED FOR CLASS 1, GROUP D, HAZARDOUS LOCATIONS

Closed View—Showing Sturdy Construction and Rounded Corners for Easy Operation and Avoidance of Skinned Knuckles

THE latest addition to the "3C" line of Type "D" Heavy Duty Push Buttons, an oil immersed station, features the same sturdy mechanism used in preceding Type D Buttons. These Push Buttons are built in accordance with Underwriters' specifications for Class 1, Group D, Hazardous Locations, with or without oil. The addition of oil eliminates the action of corrosive gas, and smothers any arc generated at the contacts.

The case consists of a heavy cast iron upper section, to which are attached the Push Button units, and a cast iron oil tank, both with wide, accurately machined flanges, thus completely assuring the cooling of any flame which may be started by explosion in the enclosure.

Provision is also made for locking in the "OFF" or "STOP" position.

Each Push Button unit has a Normally Open and a Normally Closed Contact supplied as standard. Maintained Contact Push Buttons are also available.

The Push Button units are mounted on an easily removable insulating subbase, which also acts as a wire spacer.

Our nearest office or agency will gladly give you further details.

Open View—Note Wide, Accurately Machined Flanges and Full Capacity Oil Tank

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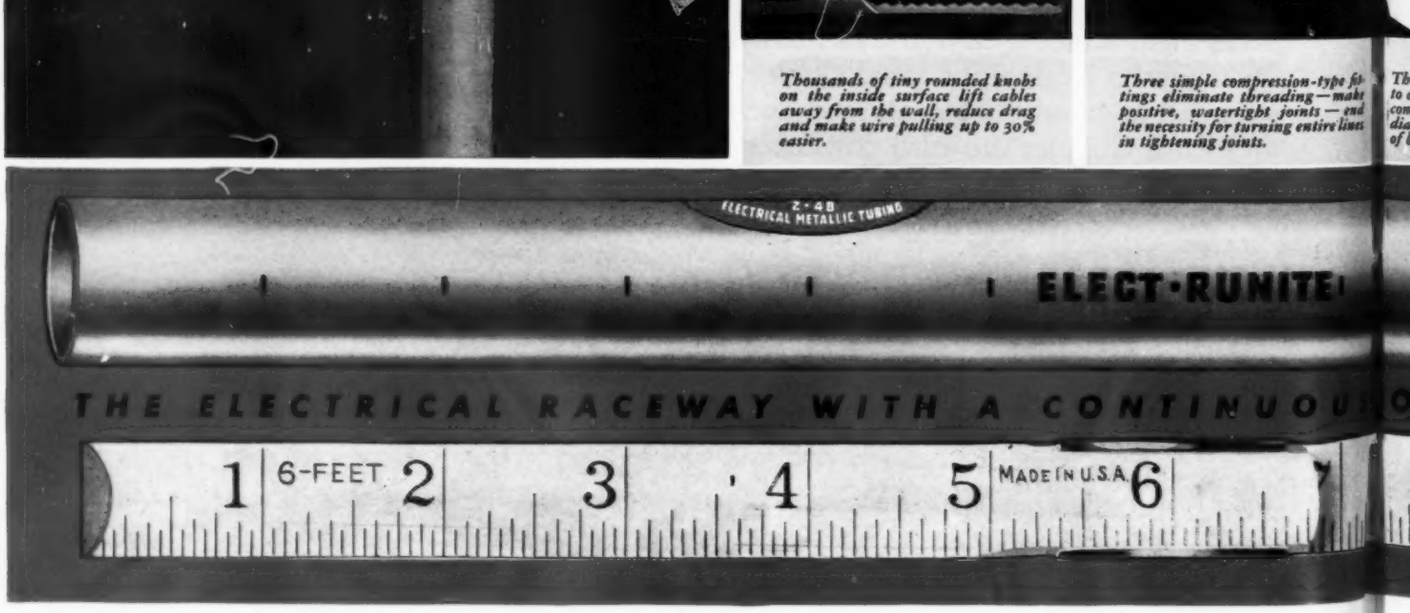

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ELECTRUNITE STEELTUBES always has been easy to use. Its light weight makes it easy to handle. The use of compression-type fittings ends tedious, dirty thread cutting. Its high ductility makes bending by hand an easy matter. And its knurled inside surface reduces wire pulling effort as much as 30%.

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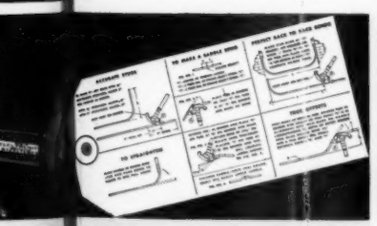
Every length actually is a 10-foot rule. You can use the tube itself to measure the distance between two points. In laying out a bend or cut, there's no danger of inaccuracy caused by rule or pencil slipping just as you are about to mark the tube. You can work more accurately with less chance for error and wasted material.

Use "Inch-Marked" ELECTRUNITE STEELTUBES on your next wiring job—exposed, concealed or in concrete—and see for yourself why we say that it is the easiest-to-use rigid steel conduit in the world. Steel and Tubes Division, Republic Steel Corporation, Cleveland, Ohio.



This new bending tag attached to every bundle of tubing provides complete bending instructions and diagrams for making various types of bends.

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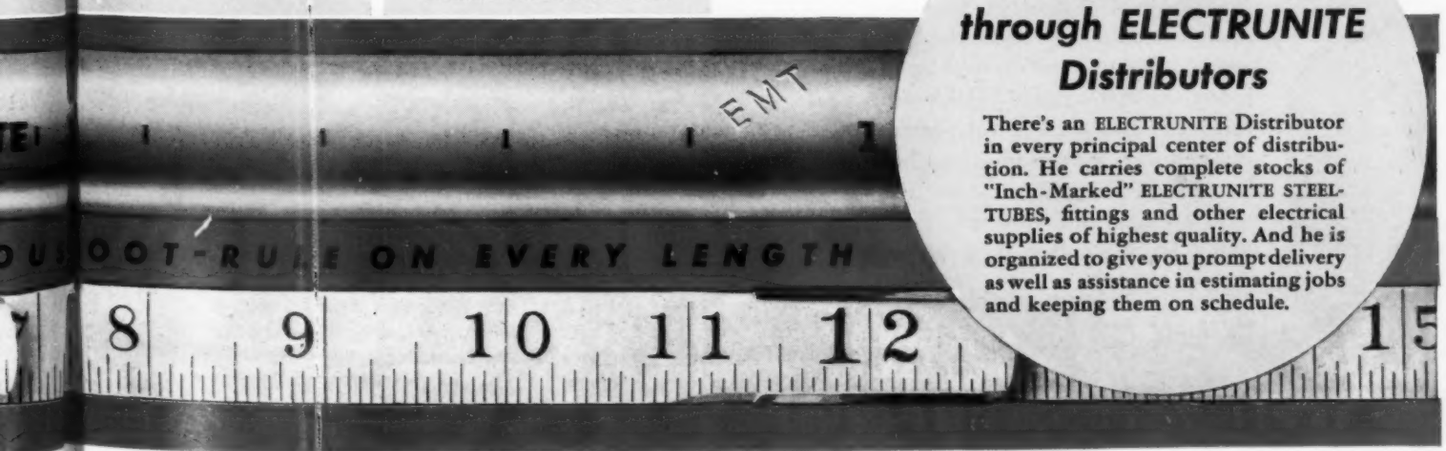
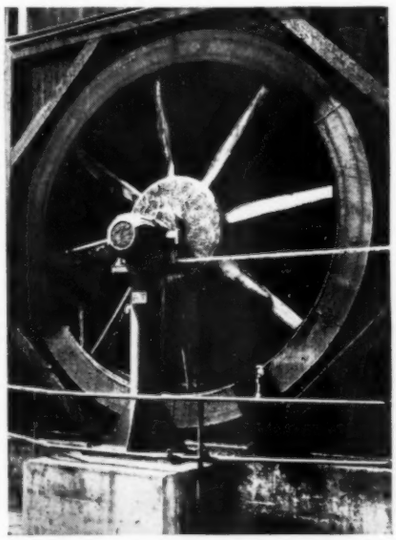


Gearmotor Used for a Tough Job

A totally inclosed fan-cooled gearmotor was installed to drive a Foster-Wheeler 12-ft. axial-flow cooling-tower fan. It operates under very severe conditions since it is exposed to the atmosphere all year round. It is mounted



***IN ALL KINDS OF WEATHER** this totally inclosed fan-cooled gearmotor drives a cooling-tower fan. (Westinghouse photo).*

at the cooling duct intake, where all dust and dirt is drawn past the motor. The installation illustrates the adaptability of this type of motor to tough jobs where an open type motor would give continuous trouble.

The 20-hp. motor is coupled direct through its self-contained gears to the slow-speed fan. This eliminates the bulk of a separate speed reducer.

Motor Control Assembly

Suitable space for placing motor controls is generally available only in some distant corner of a building at the premium of wiring costs.

In one plant 440-volt motor control was assembled in metal clad or cubicle housings similar to modern switchgear. Space is provided for incoming main feeder cable and leads to motors and push buttons. The panels are shop-assembled and shipped in large units ready for mounting on customer's foundation.

This type of panel occupied only a fraction of floor space required for the more conventional racked assemblies, permitting placement at the load centers without encroaching upon accessibility to process machinery.

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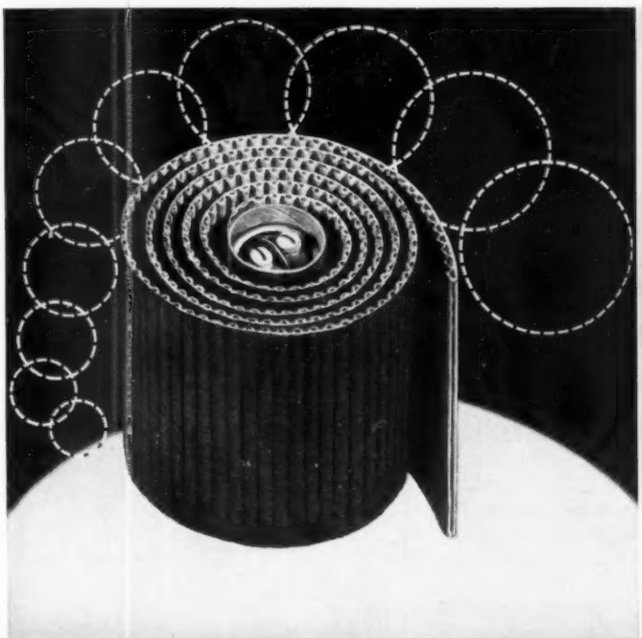
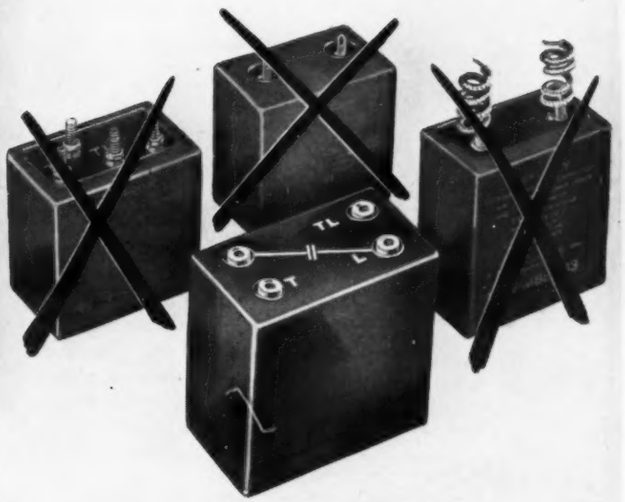
Heavy Inventory Investment with

P.R. MALLORY & CO. Inc. MALLORY Universal AC CAPACITORS





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Advantages for the construction of the power panels include:

1. Shop construction promises qualitatively better workmanship.
2. Saving in wiring all around.
3. Minimum time required for creation—highly important during last stages of mill erection, or rearrangement of plant equipment.
4. Can be readily placed where most accessible to operator.
5. Facilitates quick power survey departmentally or for entire mill with less likelihood of overlooking one department.
6. Provides quickest access to operator in charge in time of emergency.

These features were obtained without sacrifice of any safety provisions generally embodied in the standard commercial motor control, and last but not least, at a substantial saving in cost of wiring and installation.

Concentrated Light For the Rubber Mill

Localized supplementary illumination has found wide application in many industrial locations where general overhead lighting will not suffice.

The former type of lighting to be fully effective, requires that the lighting units be mounted in a definite location with respect to the machine, or work area, so that the correct illumination values will prevail at these points. At the same time, the fixture must be so

LOCALIZED LIGHTING for a rubber mill. This Westinghouse RLM 48-inch twin-lamp fluorescent fixture, mounted directly above the rubber mill, provides the necessary high illumination on the mill rolls, the most important work area. At the same time there is enough light in the surrounding space to permit safe and sure incidental operations.

located that enough light is provided, in the space surrounding the machine, to permit safe movement of men and materials.

Illumination of mill rolls in a rubber plant is a good example of an area well adapted to the localized procedure. One of the most important operations in the rubber plant is the mixing of the raw material. This is done on a mill equipped with two rolls, the gummy rubber and compounds being compressed between the rolls. Seeing requirements are stringent, as the operator judges his work by the feel and appearance of the sticky mess.

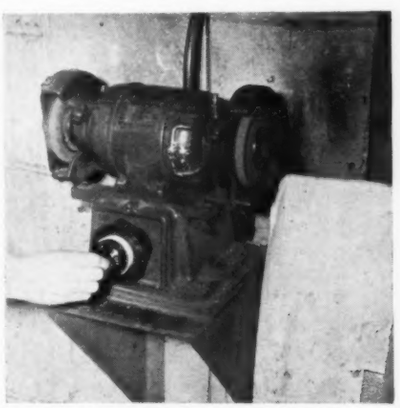
The fluorescent lamp, with its readily available high illumination intensities, and situated for localized lighting, provides a modern answer to an old problem.

Where is the Switch?

Installations of bench tools have been made where it is necessary for an employee to make inquiry regarding the location of the starting switch. Such an inquiry should be unnecessary.

In some installations the switch is mounted in the conduit run coming down the wall to the machine. In other installations the switch is several feet away from the machine.

The foregoing locations are considered poor practice. To operate the switch the employee must reach over



AT THE JOB — Rotary switch for motor is attached to cover plate on conduit box, and mounted on base of small grinder.

the machine to start and stop it and must lean over the machine while it is running, or he must take several steps away from the machine.

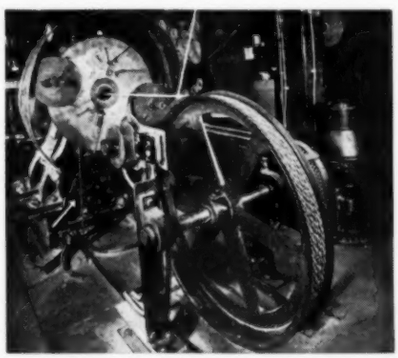
Wherever possible the starting switch should be mounted immediately accessible for the operator. A typical example is illustrated—the switch is located on and directly at the front of the bench grinder.

Drive Used for Taping Cable

Speed changes in cable-wrapping operations at Crescent Insulated Wire & Cable Co., Trenton, N. J. has been facilitated by an adjustable-speed electric drive.

Cable is formed by wire drawn simultaneously from several supply reels mounted on a rotating table. To insure an even twist to the finished cable the insulated wire must move at a uniform speed through the wrapping or taping head and on to the capstan. Both the rotating table and the capstan are operated by the same chain drive from a constant-speed motor.

The amount of wrapping varies for various diameters and specifications for cable. Changing the speed of rotation of the wrapping head, or the rate of passage through it, or a combination



ADJUSTABLE-SPEED UNIT (at right) connected to d.c. motor (arrow) drives taping head (left center). Push-buttons and speed control are shown at left of capstan (foreground).

of both, are the methods available to change the amount of lap of the covering tape. For this reason the taping head, carrying two spools of cable tape, is independently driven to permit a wide range of operating speeds.

An adjustable-speed drive (Reliance VS drive) has replaced the system of gears and pinions formerly used to obtain speed changes for the taping head. This 5-hp. 440-volt, 3-phase, 60-cycle drive is connected to a standard 1,750 rpm, 230-volt, d.c. motor. A speed variation of approximately 4:1 is now available, simply by turning a speed adjuster handle conveniently located beside the start-stop buttons on the frame of the machine.

Although both the adjustable speed unit and d.c. motor operate in an atmosphere laden with talc and soapstone dust, there has been no interruption, no breakdown, and no unusual maintenance.

Production has been speeded up, time out for making speed changes has been eliminated, and increased uniformity of product has been made possible.

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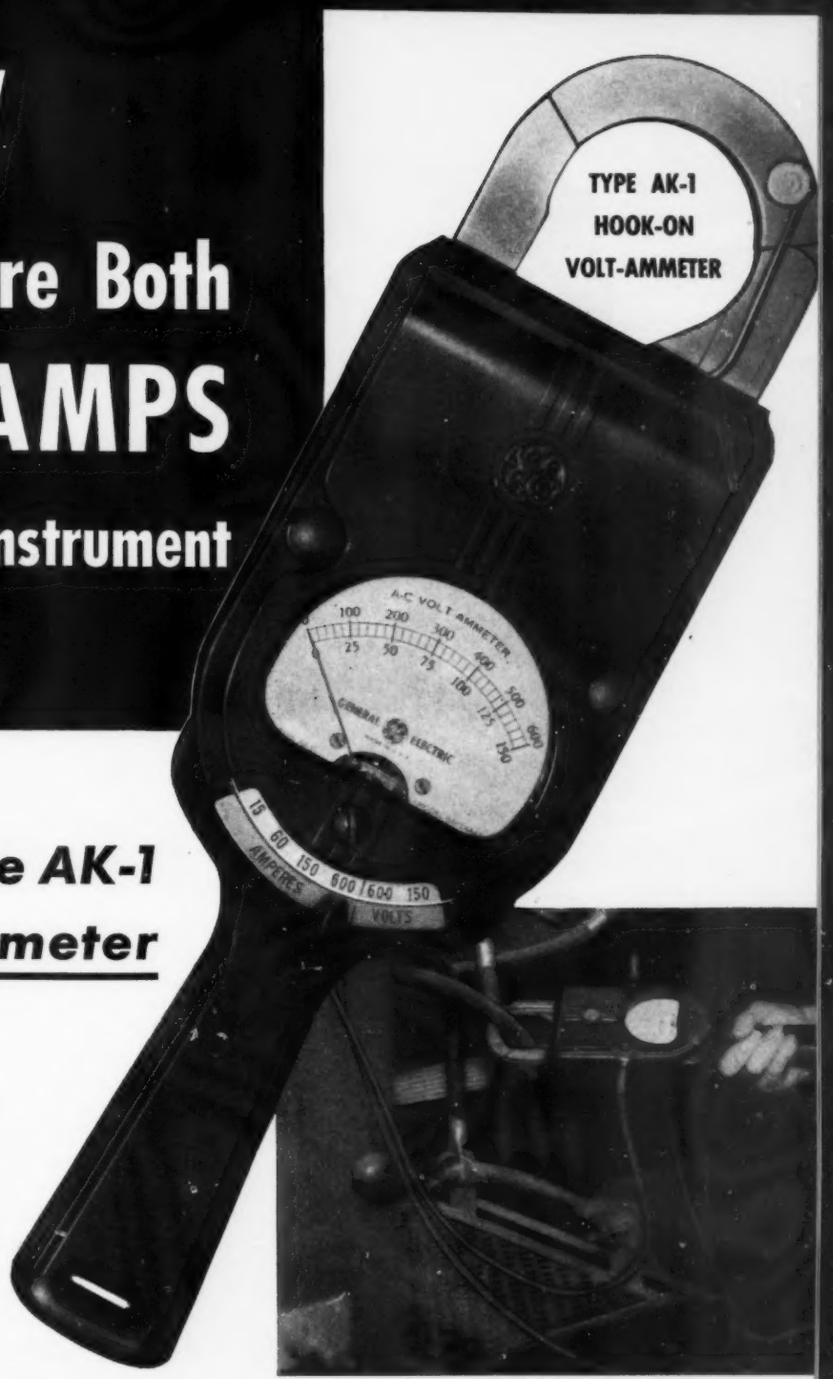


That's Why We Call the AK-1 A Hook-on Volt-ammeter

IT'S no trick at all to measure both alternating current and voltage with it. All you do is hook the instrument around the line and read amperes. Then connect the leads to the binding posts and read volts.

No Additional Equipment Needed

You don't need a separate transformer, voltmeter, or any other additional equipment. And you don't need to cut conductors or shut down equipment to make your measurements.

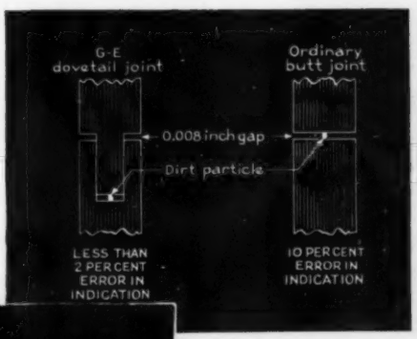
One Setup to Measure Current and Voltage

After measuring voltage, leaving the leads connected does not affect hook-on current readings. Just flick the selector switch to either "Amperes" or "Volts" according to the measurement you want.

Our bulletin GEA-2950 describes the AK-1 in detail, and illustrates how easy it is to use. Order a copy from your nearest G-E Office, or write General Electric, Schenectady, N. Y.

For Emergency and Maintenance Testing

This instrument is particularly handy for quick, accurate measurements when you have trouble with electric equipment and need the answer to circuit conditions in a hurry. Also, you will find it very useful for checking the loading of motors, and for other routine maintenance measurements.



Special Dovetail Joint Assures Consistently Accurate Readings

The hook that closes around the conductor has a dovetail joint which minimizes errors caused by unnoticed dirt lodging between the jaws of the instrument. Particles of dirt which would cause large errors in the ordinary butt joint have almost negligible effect on the readings obtained with the AK-1.

GENERAL ELECTRIC

602-15

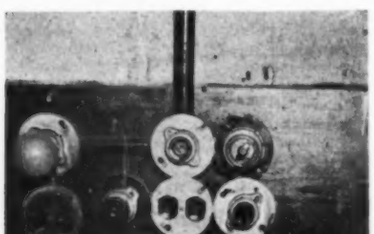
Motor Shops

COLOR CODED OUTLETS

All test outlets along the various work benches in the shop of the Electrical Motor Repair Co., Trenton, N. J., are color coded for the different single phase test voltages. The covers of the outlets are painted with a colored paint according to the following code:

Black—120 volts d.c.
Green—110 volts a.c.
Red—220 volts a.c.

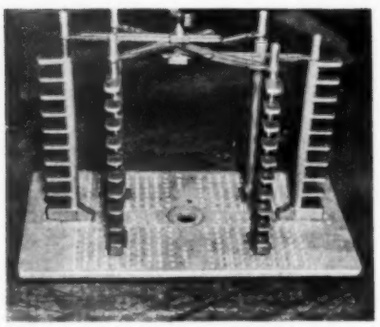
Each outlet has a second outlet connected in series with it. This second outlet is used for a fuse, lamp or resistance load in the test circuit. This method prevents confusion and indicates at a glance which test outlet has the voltage desired.



CODED OUTLETS for test purposes in this motor shop indicate by the color of their covers to what system voltage they are connected.

ADJUSTABLE COIL FORMS

A complete set of adjustable coil forms has been designed and built by Electric Engineering and Service, Inc., Westfield, Mass., to increase the scope of their winding facilities and to materially reduce the stock of coil forms necessary to rewind all types of motors.

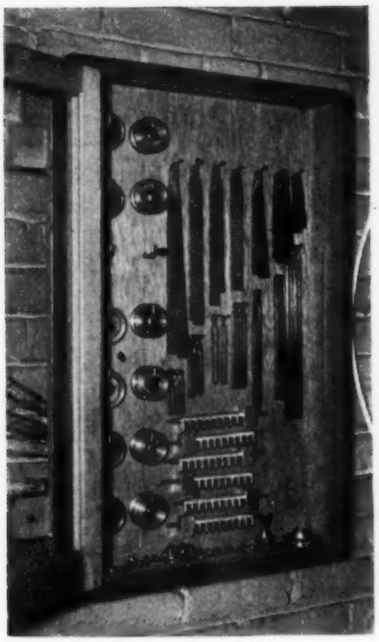


ADJUSTABLE FORM for winding any shape of coil, minimizes stock of forms necessary and expands scope of winding activities.

The set consists of six standard base plates and four miscellaneous odd size ones, together with several sets of combs on which the coils are wound. The base plates are made of an aluminum alloy and are divided into four sections, each of which has numerous holes drilled in it. The combs are inserted in these holes and fastened with a wing nut. These combs are securely braced by adjustable steel arms fastened to the top of the comb and bolted together at the center line of the winding shaft with a large wing nut collar.

The smallest of the standard base plates contains 63 holes per quarter section for the coil side combs and 12 holes for the combs at the nose of the coil. This totals to 276 adjustments for the six combs used on this one plate. The largest of the standard base plates contains 286 holes per quarter section plus 26 for the end combs, totaling 1170 adjustments. To prevent confusion, the sectional drillings are lettered horizontally and numbered vertically. The vertical drillings for the end combs are lettered.

All of the small combs are made of the same aluminum alloy as the base plates, while the larger combs are made of bronze. The extra combs, braces and accessories, together with rollers and discs for an insulation wedge former are racked in a glass enclosed wall cabinet in the winding room.

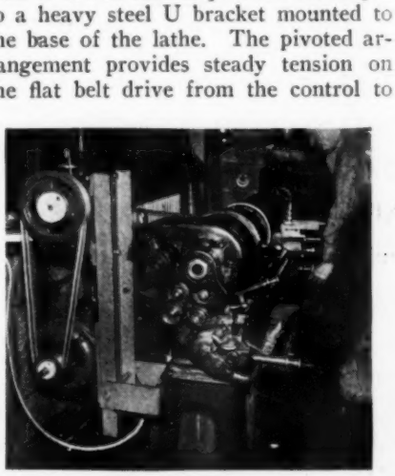


WALL CABINET for storing the spare combs, brackets and accessories of the adjustable coil forms.

This small set of coil form equipment is flexible enough so the shop can make any shaped coil either single or in groups, necessary in its rewind work.

FLEXIBLE CONTROL FOR LATHE SPEEDS

To get additional flexibility in lathe speeds, the Phoenix Electric Co., Youngstown, Ohio motor repair shop, uses a speed changer that is operated merely by turning a wheel. The control mechanism and lathe motor are both mounted on a vertical piece of channel iron which in turn is pivoted with a pin to a heavy steel U bracket mounted to the base of the lathe. The pivoted arrangement provides steady tension on the flat belt drive from the control to



HAND CONTROLLED speed changer gives added flexibility to range of lathe speeds in this motor shop.

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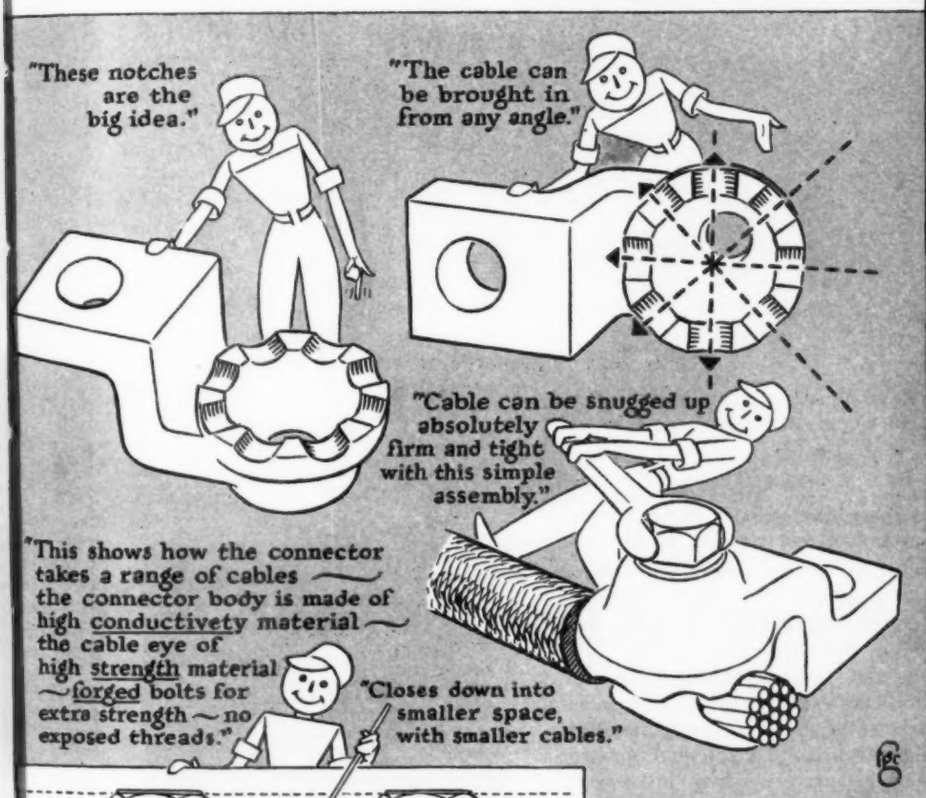
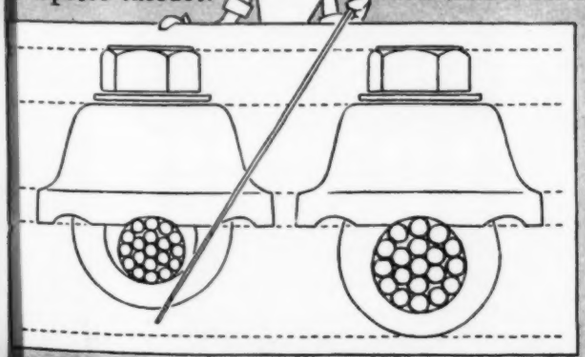
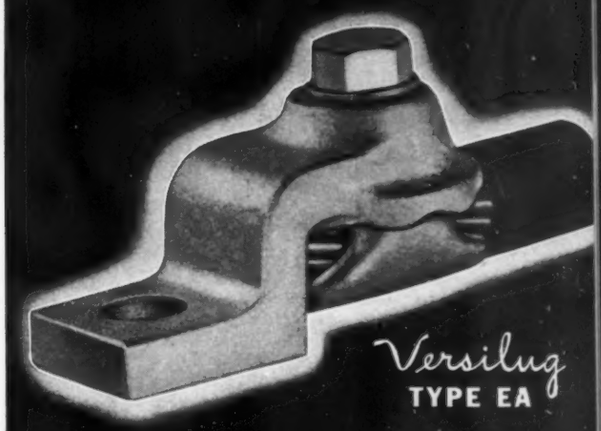
CLAMP CONNECTORS

Burndy scores again with a new idea in electrical connectors! . . . a few types that run the whole gamut of cable sizes. Besides accommodating an unusually wide variety of cables, you can JOIN CONDUCTORS TO CONNECTORS AT ANY ANGLE. The drawings below demonstrate the simple principle on a terminal connection. Apply the same principle to the other members of the new Versi-Line and you have complete coverage on a majority of your connector requirements —with a mere handful of connector types and sizes. Stock up today!







Versilug
TYPE EA

Versilink
TYPE ER

Versitee
TYPE ET

The above illustrates the positions at which conductor can join connector in the new Versilug. The same adjustment holds for other members of the Versi-Line shown at right.

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You'll find facts and figures on the new Versi-Line in the interesting price bulletins. Pictures of the new connectors, information as to their application, and complete price lists are incorporated in these bulletins. Send for your copies RIGHT AWAY!

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Kindly send me illustrated price bulletins on the new Versi-Line.

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B

Motor Shops

[FROM PAGE 48]

the lathe. A slotted flat iron bracket steadies the channel iron base and keeps it from vibrating. The control mechanism is V-belt driven by the lathe motor.

With this arrangement a total of 12 different speeds are available ranging from 25 rpm. to 650 rpm. The speed changer has four ratios, 1–1, 1½–1, 2–1 and 3–1. Using these ratios with the back gears on the lathe gives the flexibility of speed control.

SPARE MOTOR STOCK

The J. J. Reddington Electric Service Co., of Boston, specialists in electrical contracting and motor service work, is well equipped to keep the wheels of its industrial customers turning during emergency breakdowns.

For this purpose, this organization keeps an ever ready stock of reconditioned motors ranging from fractional horsepower sizes to 75 hp. and of the proper voltage and phase characteristics for the customers' needs. Each motor is ready for rental or sale and contains a tag giving the essential nameplate data and any other information

***RECONDITIONED MOTOR** stock of this shop helps its industrial customers in times of emergency and builds customer confidence.*

necessary for quick reference in emergencies.

Following a call from a customer and a glance at the stock card file, the motor is picked out, sent to the plant, installed and in a comparatively short time service is resumed. Meanwhile the burnt out motor comes back to the shop for repairs. A stock of compensators, starters and switches is also kept on hand.

Estimating

OUTDOOR TRANSFORMER MAT

Power for a recently completed manufacturing plant is procured from a transformer mat located in an exterior corner of the building. The concrete mat is approximately 16 feet long and 10 feet wide. The building walls form two sides of the enclosure; the conventional wire fence forms the other two.

The mat contains three 150 kva, single phase oil cooled 4150/120/208 volt transformers, fed underground from a primary cubicle inside the building. The cubicle is fed overhead from a pole located inside the wire enclosure and adjacent to the mat. The secondary bus work on this three phase four-wire system is composed of two ¼-inch by 4-inch copper buses per phase and neutral leg, mounted on insulated supports clamped on a 1½-inch iron pipe rack. The neutral bus which runs almost the full length of the mat is the only one that crosses over the other buses when entering the building. The three phase legs are arranged in two rows and pass through the wall in the same horizontal plane. An ebony asbestos split panel, painted with mastic cement, covers the opening in the wall and provides a waterproof seal for the entering buses.

The pipe rack is 13 feet long, 6 feet high and three feet deep. It is fastened to the brick wall by four floor flanges and to the concrete mat in a similar manner. The primary cable support is constructed of a 10-foot length of channel iron mounted about three feet above the mat.

The electrical contractor on the job kept an accurate record of the labor breakdown for the complete job, from the primary cubicle feeder to painting the splices at the transformers. The following is the list of material and labor required:

MATERIAL USED

125 feet—¼-in. by 4-in. copper bus
50 feet—1½-inch conduit for rack
50 feet—1½-inch conduit for ground runs
15 feet—3½-inch conduit
10 feet—3-inch conduit
5 feet—3-inch flexible conduit
2—3½-inch conduit elbows
1—3-inch conduit elbow
2—3-in. flexible conduit connectors
10—insulated bus bar supports
15 feet—¼-in. by 1-in. copper ground strap
60 feet—No. 2/0 v.c. lead covered cable
60 feet—No. 2/0 v.c. cable

All necessary miscellaneous material to do the job.

LABOR REQUIRED TO INSTALL THE MATERIAL

INSTALL PRIMARY CONDUITS—includes laying out, cutting, assembling and installing the 3-inch overhead service from the pole to the cubicle and the 3½-inch conduit from the cubicle to the transformer mat. Also the 1¼-inch ground conduit to water main.
Total time..... 11.0 m. h.

INSTALL PRIMARY CABLES—includes measuring, cutting and installing the v.c. and v.c. lead-covered cables in the overhead and underground conduits from pole to cubicle to the mat.
Total time..... 6.0 m. h.

INSTALL SECONDARY BUS RACK—includes the layout, fabrication, assembly and installation of the pipe rack to support the secondary copper buses. Rack is mounted to the building wall at four points and to the concrete mat at the same number of places.
Total time..... 16.0 m. h.

MOUNT BUS SUPPORTS—includes mounting 10 insulated secondary bus supports on the pipe rack; also extending the 3½-inch conduit at the building and mat and miscellaneous work on the service.
Total time..... 16.0 m. h.

INSTALL SECONDARY BUS—includes cutting the copper bus into 24 pieces of various lengths; making 22 right angle bends in the copper; punching holes for bus, transformer and switchboard connections; and mounting the buses on the rack supports. The buses extend from the transformers inside the building to the switchboard.
Total time..... 42.0 m. h.

SECONDARY TRANSFORMER CONNECTIONS—includes measuring, cutting and installing transformer lead extensions, two per leg, and making all connections from transformers to the buses.
Total time..... 16.0 m. h.

INSTALL PRIMARY BUS SUPPORT—includes laying out, fabricating and installing the channel iron support for the primary cables at the transformers.
Total time..... 6.0 m. h.

PRIMARY CONNECTIONS—includes stripping the cables and making all primary connections at the transformer mat and at the overhead and underground cable ends in the primary cubicle.
Total time..... 8.0 m. h.

TRANSFORMER GROUNDING—includes the installation of the copper ground strap at the transformer mat and the ground wire inside the building, complete with all connections.
Total time..... 10.0 m. h.

INSTALL WALL COVER PLATE—includes the mounting of the ebony asbestos split cover over the buses where they pass through the building wall. Plate is mounted to the wall at 14 points and is filled with mastic cement at bus entrances and painted with a water proof paint.
Total time..... 5.0 m. h.

PAINTING SPLICES—includes taping and painting all primary and secondary splices on the transformer mat.
Total time..... 10.0 m. h.

COMPLETE INSTALLATION—includes the time necessary to make the complete installation described above. This labor figure is the sum total of the units in the above labor breakdown.
Total time..... 146.0 m. h.

The above labor units include the necessary time required for supervision on the job. These units are for the particular installation described and, like all other labor figures, should be used only as a guide for estimating jobs of a similar character.

Data from Garden Electric Co., Inc., Elizabeth, N. J.

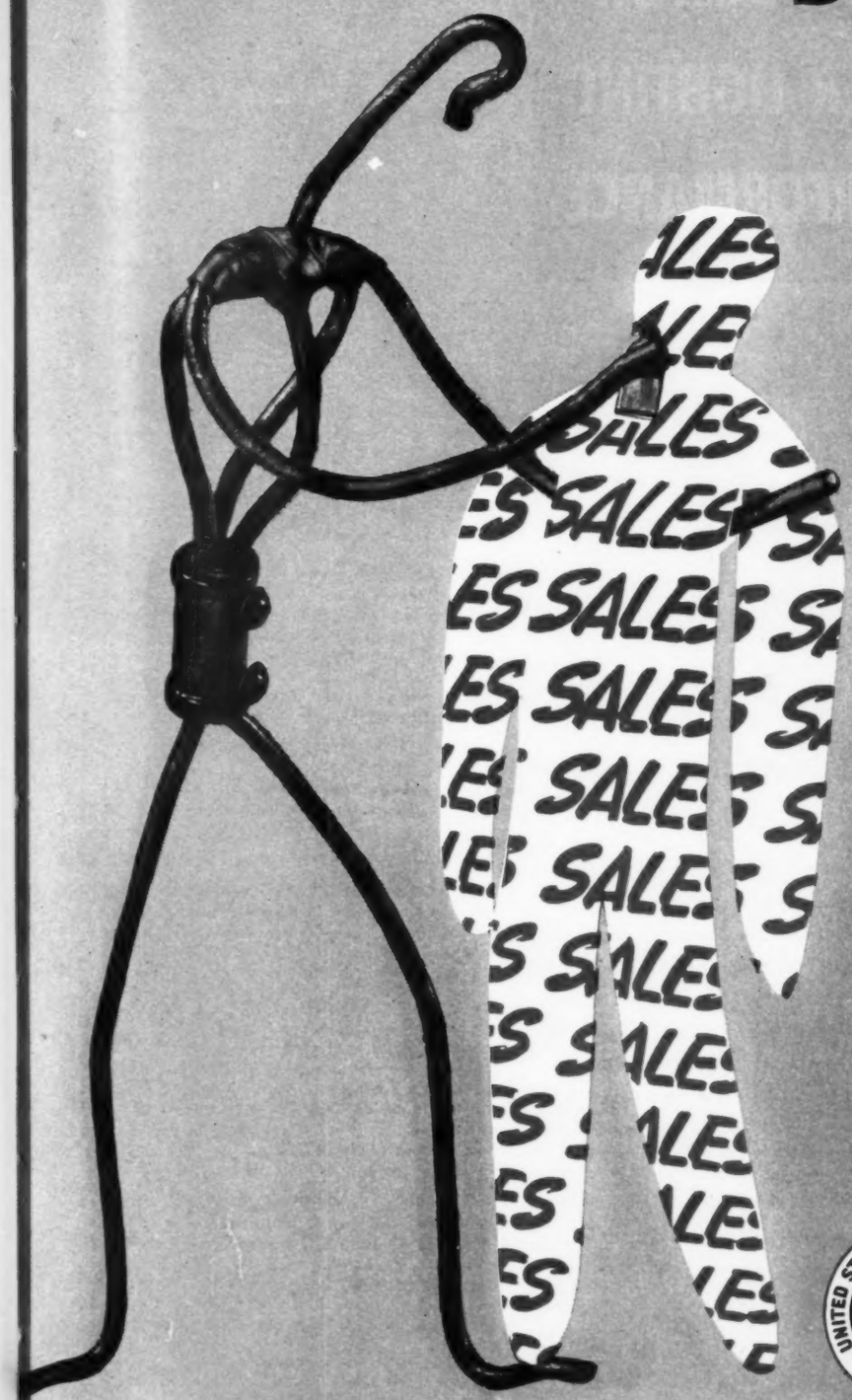
VERSATILE SUPERINTENDENT
Harry W. Baker of the Independent Electric Machinery Co. of Kansas City, Mo., shows one of numerous specialties, an electric lead pot for linotypes, developed by this prominent electric motor service organization. His hobby is making complex professional motion picture equipment.

FLUORESCENT STRIP LIGHTING

A midwest electrical contractor was recently called in to install concealed fluorescent lighting in seven recessed mattress display booths. The raceway used was 2½-inches square and cut in 48- and 36-inch lengths.

A continuous channel was installed across the top of the seven booths. This

HOW TO REVIVE "DROOPING" WIRING SALES



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Estimating

[FROM PAGE 52]

carries the circuits for all the booth lighting as well as supporting the 48-inch units at the top. The circuits were connected to a junction box installed under another contract. The units mounted at the side of each display booth consisted of two 36-inch channels nippled together. One 48-inch unit was installed at the bottom of each booth. All the units in a single display booth were tied together with greenfield jumpers and connected to the top channel.

The contractor kept an accurate record of the material and labor necessary to complete the job. This is to be used as a reference for similar jobs in the future. The material and labor breakdown is as follows:

MATERIAL USED

44—Fluorescent strip units consisting of a bottom channel and the fixture body with lamp holders, starters and necessary auxiliary equipment. Units were of both the 36- and 48-inch lengths.

21—Flexible conduit (greenfield) jumpers, each 18-inches in length.

LABOR TO INSTALL MATERIAL

MOUNTING CHANNEL—includes the mounting of the bottom portion only of the 44 pieces of the wiring channel.

Average time per unit.....0.12 m.h

INSTALLING JUMPERS—includes the installation of 21 18-inch flexible conduit jumpers to connect the wiring channels.

Average time per jumper.....0.14 m.h.

WIRING FIXTURE BODY—includes the wiring of the top of 44 channel units including the connection of the sockets, starters, necessary auxiliary equipment, tap-on leads and testing the complete unit. This work was done in the contractor's shop.

Average time per unit.....0.28 m.h.

INSTALLING WIRED SECTIONS —includes pulling in the circuits from the junction box through the channels, connecting the 44 sections wired in the shop and lamping.

Average time per unit.....0.22 m.h.

TOTAL TIME for a complete unit. This is the sum of the average time for each of the above operations.

Total time per complete unit...0.76 m.h.

No supervisory time is included in the above labor units.

Although the above job is relatively small, it is typical of common fluorescent strip lighting applications and the labor data can be used as a guide for similar jobs.

Data from Continental Electrical Construction Company, Chicago, Ill.

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Questions ON THE Code

Answered by
F. N. M. SQUIRES
Chief Inspector New York Board of Fire Underwriters

A Service Problem

Q. *"Where it is permissible by Utilities to allow a combination 3 phase 220 volt and single phase 110/220 volt 3 wire service entering in the same conduit for the purpose of serving 3 phase power and 3 wire 110/220 volt lighting, does not the Code require that these '4 wires' (if that is correct) terminate in one and the same master entrance switch, which must be 4 pole, 3 fuses with solid neutral bar for attaching neutral wire and continuing further to meter and distribution? The neutral bar to be insulated from switch box proper.*

"Would it be permissible in such an installation to substitute a 3 pole 3 fuse main switch and continuing the neutral conductor unbroken on through this same switch and terminating the neutral wire on the neutral bar or lug of the 3 wire 110/220 lighting distribution cabinet?"—A.C.B.

A. The second sentence of Section 3013 states that conductors of light and power systems may occupy the same conduit if all conductors are properly insulated. In the case stated above, we assume the service is derived from a 3 phase delta connected bank of transformers with secondary voltage of 220 and with one transformer's mid-point tapped to give the 110-220 volt single phase lighting. In this case the service switch need be only a three pole one with each pole fused and with the neutral carried to a connection strap mounted directly on the metal of the service switch enclosure. The strap should preferably be furnished with a disconnecting link although the connection of the neutral to the strap by means of a lug is a "disconnecting means."

If the neutral strap is insulated from the service equipment box, and if the service is derived from an overhead supply system, then, according to Sections 2571 and 2572, the service raceway or service cable armor sheath, all service equipment enclosures and any conduit or armor forming part of the grounding conductor to the service raceway, shall be bonded together by bonding jumpers or as otherwise required by Section 2572.

The service switch for the system described in the question may of course, be a four pole one with three fuses if desired.

The answer to the last part of the question is that the neutral service wire must have its disconnecting means in the service switch box and cannot be carried unbroken through this to the distribution cabinet. Breaking the wire and splicing the ends together even though a wire connector is used, is not acceptable as a disconnecting means.

Also when reaching the lighting distribution cabinet the neutral bus (or strap) cannot be mounted directly on the metal of the box but must be insulated from it.

Grounding Problems

The ampere load on some Cabins varies from about 15 amps. to about 50 amps. For purpose of making clear my question, assume a case of 15 amps. at 110 volts, and a second case of 50 amps. at 110/220 volt.

Q. *1. "Is it not required that the entrance switch at each cabin be grounded at the cabin? (The switches are all outdoors and one could be on wet or dry earth when touching the switch.)" D.S.P.*

A. 1. The supply system must be grounded at the master service switch and may be also grounded at the entrance switch in each cabin. If the switches at each cabin are out of doors they must, of course, be of the weatherproof type or suitably protected from the weather. Whether grounded or not there should be no possibility of the operator coming into contact with live parts.

Q. *2. "At least is it not required that the equipment be grounded at each cabin? (There is cold water from the City water system to each cabin).*

"It is contended by one camp owner that all equipment and system grounding are taken care of if the main ground is properly made, and if the neutral of each cabin switch is bonded securely to the equipment." D.S.P.

A. 2. Yes, the equipment, such as the armor of armored cable or conduit, if any, in each cabin must be grounded.

If the neutral is connected to the switch enclosure at each cabin then the neutral must be also grounded (to water-pipe) at each cabin.

As indicated in the answer to Question 1, the neutral does not have to be grounded at each cabin. If it is *not* it should *not* be connected to the switch box at that point. But the equipment in each cabin should be grounded to the waterpipe and must not rely on the connection to the neutral for its grounding.

Determination of Circuits

Q. *"Will you kindly give the National Code ruling on the following house—*

A duplex all on one floor, with one meter for both families, one convenient outlet for each kitchen (2) eight other convenient outlets and twelve overhead lights in the rest of house.

"What is the minimum amount of circuits permitted on this type of house?"—F.S.

A. In order to determine the number of branch circuits in any residential occupancy under the 1940 Code, the size of the building is needed. In Section 2108, paragraph a, the Code determines the lighting load on the basis of two watts per square foot, while paragraph c calls for 1500 watts for small appliances in each tenant

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Complete APPLETON *Line*...

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High-pressure production, all along the line, re-emphasizes the vital importance to industry and to the safety of America of every precaution against the hazard of explosion!

There's profitable business for you in a thorough sales canvass of the hazardous locations of your community (see Section 12, Pages 2 and 3, Appleton Catalog No. 11). Point out the explosion hazards, figure the nominal cost of a new, safe installation using Appleton Explosion-Proof Fittings, cooperate with underwriters to estimate insurance premium reductions.

Appleton Explosion-Proof Fittings have the same quality characteristics that mark the entire Appleton line. Cast of malleable iron in our own foundries where every operation is closely guarded to insure smoothness and freedom from holes, blemishes, and gating marks. All are tested on the basis of a high safety factor as prescribed by Underwriters' Laboratories and are capable of withstanding high internal pressure of explosions. They are neat and compact, yet are so skillfully designed that openings are roomy, with ample space for wiring or splicing.

The Appleton line is *complete*—the *proper* Explosion-Proof Fitting for every regular, and many special, requirements. Appleton stocks are *complete*—service is fast and dependable. Write for catalogs and name of nearest Appleton wholesaler.

APPLETON ELECTRIC PRODUCTS REG. U.S. PAT. OFF.

The name "Appleton," the registered trade-mark, "Unilets," or the famous circle-A Appleton trade-mark shown above, appears on every Appleton fitting. *We manufacture no private brand goods!*

SOLD THROUGH WHOLESALERS

APPLETON ELECTRIC COMPANY

1704 WELLINGTON AVENUE CHICAGO, ILLINOIS

Branch Offices: NEW YORK, 76 Ninth Avenue • DETROIT, 7310 Woodward Avenue
CLEVELAND, Keith Building • SAN FRANCISCO, 655 Minna Street • ST. LOUIS, 420 Frisco Bldg.
LOS ANGELES, 100 North Santa Fe Avenue • ATLANTA, 203 Luckie Street, N. W. • MINNEAPOLIS, 305 Fifth Street, S.

Resident Representatives: Baltimore, Birmingham, Boston, Cincinnati, Dallas, Denver, Kansas City, Milwaukee, New Haven, New Orleans, Philadelphia, Pittsburgh, Seattle

APPLETON

Conduit Fittings • Outlet and Switch Boxes • Explosion-Proof Fittings • Reelites

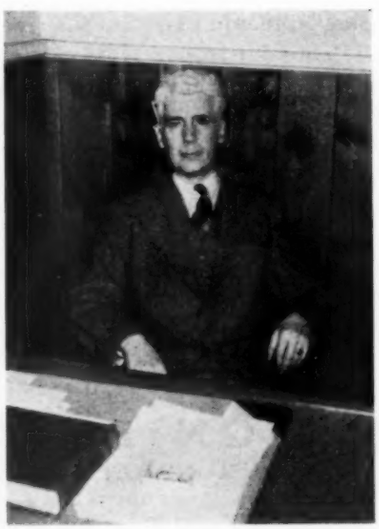
Questions on the Code

[FROM PAGE 56]

space, or in this case, 3000 watts for small appliances. The No. 12 circuits referred to in Section 2109 may be either a 15 or 20-ampere circuit, but if a 20-ampere circuit is used heavy-capacity receptacles are required (2135-b). As there is nothing requiring such a separate circuit for each tenant, a single No. 12 circuit could be provided for the kitchen, dining room, etc. of both tenants, although this would not be as desirable as a separate appliance circuit for each tenant.

Likewise, the number of circuits for the entire house would be determined by Section 2108 for the house as a whole rather than for each tenant separately. In other words, after determining the lighting load at 2 watts per square foot, plus the small appliance load of 3000 watts, you obtain the total load which is then used for determining the number of branch circuits. This number would include the No. 12 branch circuit of Section 2109.

In order to use 1½-amperes per outlet as referred to in your letter for determining the number of branch circuits, the installation would have to consist of a single-family dwelling of less than 500 square feet. (See note in middle of page 29 of the Code).



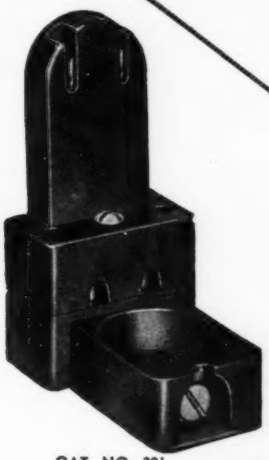
LABOR COOPERATION is sought by T. J. Cook, president of Palisades Electric Company, one of the oldest contracting firms in Yonkers, N. Y. Mr. Cook believes that all contractors, whether union or non-union should be able to compete on an equal basis for residential, repair and maintenance work. Under the present labor set-up he finds this practically an impossibility.

LEVITON

These are but a few of the fine Leviton wiring items produced by Leviton for residential, commercial and industrial work. You will find them all good profit makers . . . your end of their up-to-the-minute design and manufacture in Leviton's modern plant.

Have you seen Leviton's latest devices? Ask your wholesaler to show them to you. Or, if more convenient, drop us a line, and we will gladly send a sample and complete details on any item you may wish.

CAT. NO. 379



CAT. NO. 381

All types of Fluorescent fixture devices—push in type—sturdy construction and easily mounted. Can be mounted with either 2 screws or with 1 screw as shown.

CAT. NO. 380

CAT. NO. 720

CAT. NO. 572

CAT. NO. 669

PULL CHAIN CANOPY SWITCHES

Rated 3A-250V, 6A-125V T (T rated for Type C loads) These switches are made in Single Pole, two circuit and two speed types and are adapted to fit low canopies. The body of the switch is only 1 3/16 inches in diameter by 1 inch overall height, and contains a very fine accurate snap action mechanism. Can be used on Fluorescent Fixtures or appliances requiring this high rating.

WRITE FOR CATALOG

LEVITON MANUFACTURING CO.
236 GREENPOINT AVE., BROOKLYN, N. Y.
111 N. Canal St., Chicago, Ill. 420 S. San Pedro St., Los Angeles, Calif.

In the News

DAKOTA CONTRACTORS STUDY '40 CODE

A detailed review of the new Code rules on branch circuits, feeders and over-current protection with special reference to farm wiring and class II hazardous locations in feed mills, flour mills and grain elevators held the attention of 45 electrical contractors at the fall meeting of the North Dakota Electrical Contractors Association in Fargo, November 14–16. The attendance, although under the usual number, was exceptional as the meeting was held immediately following one of the most destructive blizzards in the history of the North Central area.

Predicting the elimination of type R wire from ordinary wiring in the Middle West, Glenn Rowell, of the Fire Underwriters Inspection Bureau, Minneapolis, called attention to the high ambient temperatures which prevail in attics during the summer months, frequently above 110 degrees. The maximum ambient allowable on Type R wire is 104 degrees, he said, at rated current capacity.

Rigid heavy wall conduit is the only permissible wiring system for Class II hazardous locations in grain elevators and mills, E. O. Day, Mill Mutuals, Minneapolis, told the contractors. With a series of charts he demonstrated approved methods of wiring for power and light where dust explosion hazards are present. Grounding practices and protection. from surges by ground inter-connection, lightning arrestors and surge capacitors in elevators was the subject of an extended discussion following his talk.

W. C. Stephenson of the Modern Kitchen Bureau outlined the objectives and methods of the Bureau in promoting the sale of electrical home equipment. W. A. Ritt, Minnesota Electrical Council, urged closer cooperation with the state association toward building better business methods. Later in the program he spoke about the use of business forms to increase profits and stop losses, displaying the material prepared by the Minnesota Electrical Council, which provides for every business form needed in conducting an electrical contracting business.

National defense will bring more business, but will create new problems in estimating and labor supervision, W. T. Stuart, Middle West Editor of *Electrical Contracting*, predicted in reviewing the local effects of the national defense program. A demonstration of lighting and fluorescent effects was given by L. P. Paste and Duke Johnson of the Northern States Power Co. R. G. Bush of Westinghouse Electric and Manufacturing Company announced a new design in branch circuit breaker construction employing both thermal and magnetic action.

Other speakers on the program were George Garney, Minnesota State Board of Electricity; Paul J. Murray, G. E. Supply Corporation of St. Paul; Porter Talcott, Dakota Electric Supply Co., Fargo; O. A. Glasow, Northern States Power Company; Fred W. Trayser, General Electric Co.; B. K. Skeels, Bismark and Frank Johnson, Fargo.

NATIONAL ADEQUATE WIRING CONFERENCE

The First National Adequate Wiring Conference, sponsored jointly by the National Bureau and the International Association of Electrical Leagues, was held at the Palmer House, Chicago, Nov. 12. Approximately 100 industry representatives heard the case history presentation of five outstandingly successful adequate wiring promotional plans known as the Minnesota, Chattanooga, Inland Empire, Wisconsin and West Penn plans.

NEMA PRESIDENT E. O. Shreve accepts the gavel from retiring association president C. E. Swartzbaugh, at the annual meeting held in New York. Mr. Shreve is vice-president of the General Electric Company.

In opening the conference, O. C. Small, secretary of the National Bureau, stated that the success of the four preceding regional conferences had led to this first national meeting and that there would probably be many more of this type.

W. A. Ritt, in presenting the Minnesota Plan, emphasized the fact that this, more than statewide activity, centered around the electrical contractor as the key man. While this program will certify about 60 homes up to 1941, Mr. Ritt stated that nearly 600 jobs have been materially increased.

The Chattanooga Plan was presented next by C. B. Osborne, manager, Sales Department of the Electric Power Board and past president of the Electric League of Chattanooga. This program is one in which a closely cooperating local industry group effectively ties in wiring with other promotions and has been successful in creating a large amount of newspaper publicity. By November 12, this League had certified 109 homes and 220 more had their wiring standards increased.

Homer C. Bender, Washington Water Power Company and secretary of the Spokane A. W. Bureau, discussed the Inland Empire Plan. This program has a special type of contractor tie-in whereby some 46 electrical contractors have joined forces with builders, dealers, banks and lumber dealers to tell the story. This group has certified 120 homes and completed A. W. plans for a total of 267 jobs. In Spokane, wiring is being promoted in cooperation with the Spokane Better Housing Bureau, which works on A. W. plans. Next year, commercial rewiring will be stressed.

The Wisconsin Plan was presented in a dramatic illustrated talk by L. A. Falk, supervisor, Dealer Cooperation, Wisconsin Power & Light Co. Mr. Falk used numerous charts and props to give the audience a new slant on the rapid increase in lighting and appliance use with the resultant inadequate wiring problems which invariably arise.

C. M. Fife, manager, Electrical Home Bureau, West Penn Power Co., analyzed the West Penn Plan, which is a highly organized over-all promotion on certified wiring covering 8,700 square miles of territory including 206,000 residential customers. Mr. Fife also described the operation of the Electric Home Bureau, an elaborate field organization embodying employee training, layout preparation, application, inspection and Red Seal certification of homes together with a comprehensive advertising program. Red Seal certifications under this program increased from 44 in 1929 to 1090 in 1939 and an estimated 1400 for this year.

The conference was concluded with an open forum at which time the delegates directed questions to the various speakers. A. H. Kessler, promotion manager of the North Central Associated Electrical Industries, was conference chairman.

All sizes of Double Wound Type Transformers from .50 KVA to 5 KVA size are of the design shown here as are also the Single Wound Transformers from .100 to 10 KVA sizes. The Transformers illustrated are 5 KVA, 2 KVA and .5 KVA, respectively.

SAVE TIME—REDUCE COSTS on New Plant Wiring and Re-Wiring Jobs

WHEN rearmament programs mean new and extended plants—Jefferson Power Circuit Transformers will simplify the installation—save time and reduce costs.

Install higher voltage power circuits only and provide lower voltage for lamps, fans, electric tools and appliances by placing Jefferson Transformers where required.

Instead of two separate systems—one higher voltage power *and* one lower voltage system —only one is required, eliminating duplication, and reducing installation time and costs. Being air-cooled, Jefferson Transformers do not require separate vaults or compartments.

The new improved designs incorporate the accumulated experience of our specialized transformer engineers to insure the utmost in maintained high efficiency over the long periods of continuous everyday duty that power circuit transformers are called on to withstand.

New Bulletin Just Published

Just off the press is our new Bulletin 401-PCT which includes interesting information and data on present day electrical practice. Let us mail you a copy. JEFFERSON ELECTRIC COMPANY, Bellwood, Ill. Canadian factory: 60-64 Osler Ave., W. Toronto, Ont.

JEFFERSON

POWER CIRCUIT . . . *Air-Cooled*

TRANSFORMERS

Write for Copy of New Bulletin 401-PCT.

In the News

[FROM PAGE 60]

LEAGUE CONFERENCE STUDIES REWIRING

The great residential rewiring market and potential rewiring work in commercial buildings held the spotlight at the fifth annual meeting of the International Association of Electric Leagues held in Chicago, November 13–14. League secretaries and representatives from all points of the country boosted the registration figure to nearly 100.

Talking about a successful campaign on residential rewiring, J. B. Watkins, of the lighting and wiring sales division of the Commonwealth Edison Company of Chicago, reviewed advertising and sales promotion methods used to sell added outlets. The rewiring, sold at unit prices, is sublet to electrical contractors, he said.

The story of an aggressive and challenging campaign for selling rewiring to commercial buildings was told by G. W. Barker, manager of the North California Electrical Bureau. In San Francisco there is a potential market for $2,500,000 worth of commercial rewiring in a limited area, and the rewiring campaign already has sold $448,700 of this, he claimed. Rewiring to 8 watts per square foot, modern lighting and 100 per cent increase in connected load, he said, are some of the results accomplished.

The two day program covered the full range of League activities in many parts of the country. Ralph Raymond, Secretary of the Chicago Lighting Institute reviewed the league's place in promoting fluorescent lighting. Trade relations, public relations, industrial fellowship through social activities, appliance shows and trade shows were discussed by a series of speakers including W. A. Ritt, North Central Associated Electrical Industries; J. E. North, Electric League of Cleveland; E. P. Zachman, Cincinnati Electric Association; G. E. Lewis, Rocky Mountain Electric League and C. H. Christine, St. Louis Electrical Board of Trade.

A. A. Gray, Electric Association of Chicago and W. J. Masters of Essex Electric League discussed league work with electrical maintenance engineers. Appliance sales and promotion methods were reviewed by J. A. Morrison, Electrical Association of Philadelphia; N. C. Christopherson, Electric League of Milwaukee; G. A. Gardner, Duquesne Light Company; J. S. Bartlett, Electric Institute of Washington and E. J. Strong, Electric League of Utah.

At the closing session the new officers for 1941 were elected. They are J. S. Bartlett, Electric Institute of Washington, President; C. H. Christine, St. Louis Electrical Board of Trade, Vice President; and J. A. Morrison, Electrical Association of Philadelphia, Treasurer.

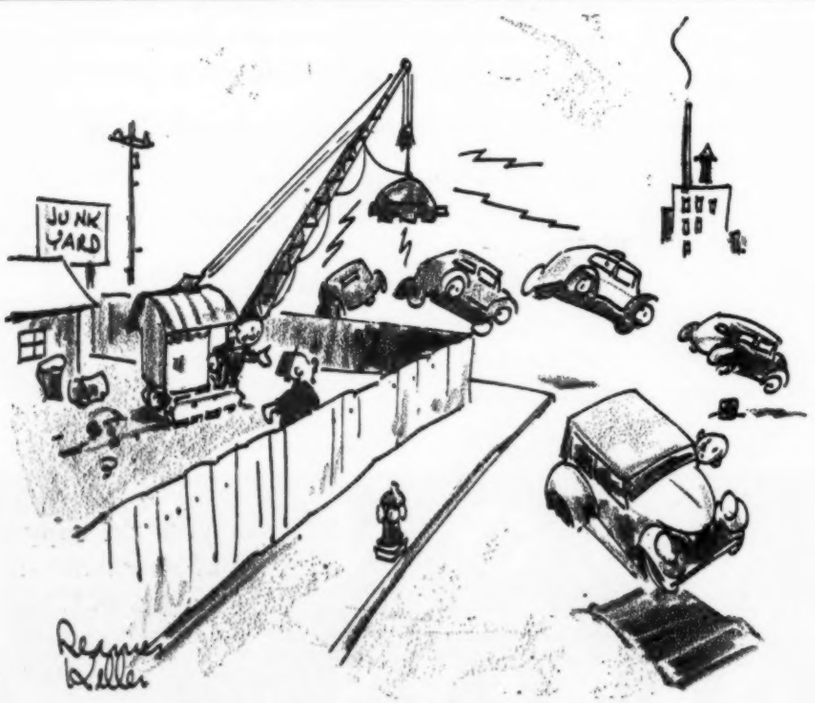
NEW PRESIDENT, J. S. Bartlett of the Electric League of Washington was elected president of the International Association of Electric Leagues in Chicago on November 14

BULK BUYING BY UNCLE SAM

Centralized purchasing of electrical equipment and fixtures for houses in the defense housing program—for industrial workers, civilian employees of the military and enlisted men's families—is being pushed in Washington. The Treasury Department's Procurement Division is handling the work for the Federal Works Agency.

The centralized purchasing will apply specifically to such items as electrical refrigerators, ranges and water heaters. Efforts also are being made to handle lighting fixtures the same way. Originally, it was felt that packaged supplies of all electrical equipment including wire cut to size, switches, sockets could also be put up in large quantities for mass buying, but this plan has been shelved at least temporarily. The first project under contract—700 units in two-story four and eight unit multiple buildings at Fort Knox, Ky.—provides that the contractor obtain and install electrical wiring at the site.

Housing projects in this program will be standardized as practicable. Specifications for electrical outlets and fixtures will vary, of course, but within certain limits not yet completely clear. Current for these developments will be obtained from existing distribution systems wherever possible and it is probable that individual metering and billing will be provided except at Army reservations.

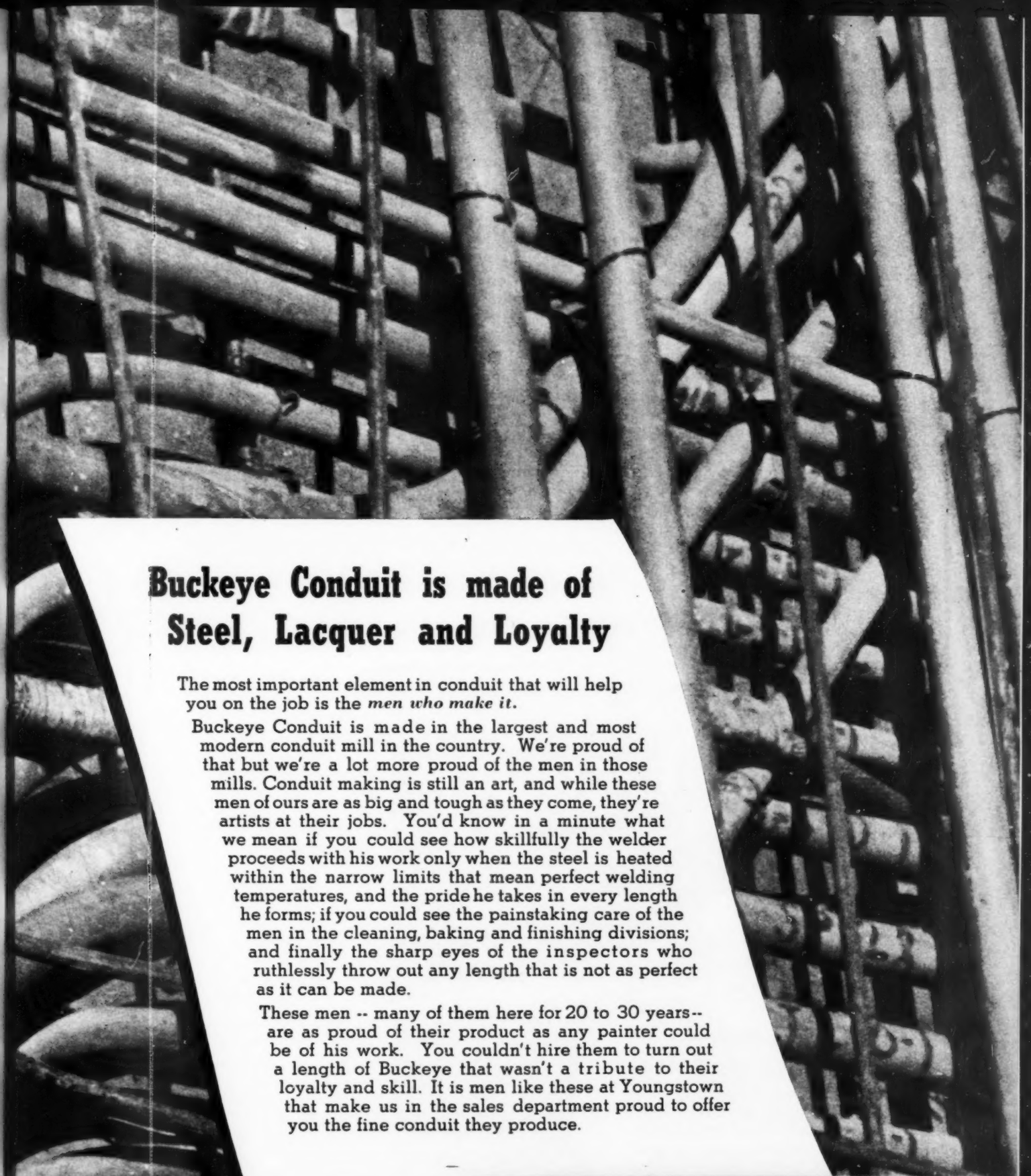


"See, this is what I mean, Boss—that electric motor repair shop got the magnet too strong!"

JAMES R. STRONG DIES

James R. Strong, pioneer electrical contractor, known throughout the entire industry through many years of active leadership, died at his home in Short Hills, New Jersey on October 25th. He was one of the founders and three times president of the National Electrical Contractors Association. Mr. Strong was born in New York City, in 1861 and had his business there until his retirement in 1933.

He was a graduate of Trinity College, and in his work was associated with the U. S. Electric Light Company in Newark, N. J., then with the Watts Campbell Company and the U. S. Illuminating Company of Newark. In 1892 he became president of the Tucker Electric Construction Company and remained its head



Buckeye Conduit is made of Steel, Lacquer and Loyalty

The most important element in conduit that will help you on the job is the *men who make it.*

Buckeye Conduit is made in the largest and most modern conduit mill in the country. We're proud of that but we're a lot more proud of the men in those mills. Conduit making is still an art, and while these men of ours are as big and tough as they come, they're artists at their jobs. You'd know in a minute what we mean if you could see how skillfully the welder proceeds with his work only when the steel is heated within the narrow limits that mean perfect welding temperatures, and the pride he takes in every length he forms; if you could see the painstaking care of the men in the cleaning, baking and finishing divisions; and finally the sharp eyes of the inspectors who ruthlessly throw out any length that is not as perfect as it can be made.

These men -- many of them here for 20 to 30 years -- are as proud of their product as any painter could be of his work. You couldn't hire them to turn out a length of Buckeye that wasn't a tribute to their loyalty and skill. It is men like these at Youngstown that make us in the sales department proud to offer you the fine conduit they produce.

BUCKEYE TRADE MARK YOUNGSTOWN CONDUIT

26-19 C

THE
YOUNGSTOWN
SHEET AND TUBE COMPANY

Manufacturers of Carbon and Alloy Steels

General Offices - YOUNGSTOWN, OHIO

In the News

[FROM PAGE 62]

until he dissolved it upon his retirement forty years later.

"Jim" Strong was active in electrical industry affairs through many years. He ably represented the electrical contractor

JAMES R. STRONG

in industry affairs over a long period. He will be mourned by a great many friends, with whom his retirement of seven years ago broke a long and close association in the work of advancing electrical progress.

FLUORESCENT SCHOOL IN CHICAGO

The Chicago Lighting Institute held its second fluorescent lighting sales conference on November 11, 13 and 15 at the Institute headquarters in Chicago. Under the direction of C. W. Zersen of the Institute's staff a corps of instructors from various branches of the industry conducted an intensive one-day course in the design, application and sale of fluorescent lighting equipment. To take care of the large advance registration the course was twice repeated.

Provided with a time schedule and divided into six classes, electrical contractors, wholesalers salesmen, utility salesmen, and lighting engineers were routed through ten lectures and demonstrations.

The subjects ranged from fundamentals to advanced design practice. Characteristics of fluorescent lamps and lighting under instructors C. R. Stover and W. N. Aldrich; fundamental terms in lighting under instructors O. W. Bard and J. A. Harrington; lighting for merchandising under instructors L. I. Whitchurch, G. K. Hardacre, G. G. Boyd, and C. N. Carlson.

Instructors M. W. Ross, E. L. Shervey

[FROM PAGE 64]

and E. A. Foster presented a slide review of recent fluorescent installations; instructors P. M. Kauffman and B. G. Wood presented better light for better sight in offices and schools. On the financial side of the subject instructors L. V. James and D. C. Fowler discussed "balancing the account for lighting," a review of methods of estimating lighting costs.

Operating difficulties in fluorescent systems were explained by instructors C. R. Stover and W. N. Aldrich. O. A. Hill and E. J. Phelan demonstrated lighting for production in the factory with the aid of modern industrial fluorescent equipment.

The design of fluorescent equipment was discussed by instructors E. D. Tillson, F. J. Vodicka, J. J. Oberhausen and H. R. Weibel under the subject of fluorescent luminaires, types and materials in the elaborately equipped fluorescent clinic. Instructors O. W. Bard, J. A. Harrington, L. A. Russ and R. E. Lagerstrom held an intensive course in laying out and designing fluorescent lighting installations.

Approximately 900 men attended these classes during the conference.

A-W BUREAU ACTIVITIES

The local certification groups of the National Adequate Wiring Bureau are seeing to it that the homes of America have enough wiring to permit safe, convenient and comfortable living. Here is a resumé of the activities in some of these cities and towns.

Jacksonville, Fla.—The recently organized certification group here has issued its first A/W certificate. The house was built by A. L. Wadlins, Jr., and the wiring installed by the Henderson Electric Company. The story of adequate wiring is being told daily on radio programs.

Chattanooga, Tenn.—The one hundredth certificate for an adequately wired home was recently issued by the Electrical League of Chattanooga. It is estimated that approximately an additional 200 houses have been inspected and are fairly adequately wired although they do not quite meet the approved standard for certification.

Fond du Lac, Wis.—The A/W Bureau has recently certified the wiring in the first home to meet the approved standard. A. A. Kaufman, electrical contractor, is chairman of the local wiring group.

Benton Harbor, Mich.—Two electrical contractors, "Del" Gilbert and Manna Woodworth, have built an "Alice in Wonderland" Electric Home in which adequate wiring was a principal feature.

Denver, Colo.—The Rocky Mountain Electrical League recently closed its third adequately wired home after a three-week demonstration. This five room house, costing approximately $4,500, was visited by 10,000 persons.

Dallas, Tex.—Approximately 100 A/W certificates have been issued here out of a

In the News

[FROM PAGE 69]

total of about 280 wiring layouts prepared by the Dallas Power & Light Company.

New Orleans, La.—It is estimated here that the number of adequately wired certified homes will reach 50 for this year. The certification program got underway within the past several months and approximately 30 homes are on the certification list as of the middle of October.

Pittsburgh, Pa.—The Electric Home Bureau of the West Penn Power Company states that, for the second time this year, certified wiring applications received have exceeded all past records. During September, there were 221 applications. Of this number, 151 installations were certified. This represents an increase of 36 per cent over the same period in 1939.

Peoria, Ill.—The local A/W Committee announces that the "Young America" model home in the Forrest Hills subdivision has been awarded an A/W certificate.

St. Paul, Minn.—The first adequate wiring certificate to be issued here, under the Minnesota state-wide Certification Plan, by the North Central Associated Electrical Industries, was one of three homes certified upon application of Arthur W. Swanson, electrical contractor. At a recent meeting at Rochester, Minn., forty-six electrical contractors from all the counties registered for the Adequate Wiring Plan. This brings the total number of contractors registered in the State to 301.

Elkhart, Ind. — The Elkhart A/W Bureau, announces that 90 per cent of new homes being constructed here conform with A/W standards.

—WITH THE— Manufacturers

Graybar Changes

Graybar Electric Company, Inc., New York announces the following changes in organization:

L. H. Whitten, formerly manager of the Washington, D. C. office, has been appointed general communications sales manager, reporting to D. H. O'Brien, general sales manager. His headquarters will be at Washington, D. C.

J. H. McDonnell, formerly line material and supply specialist at Philadelphia, has been appointed acting manager of the Washington branch.

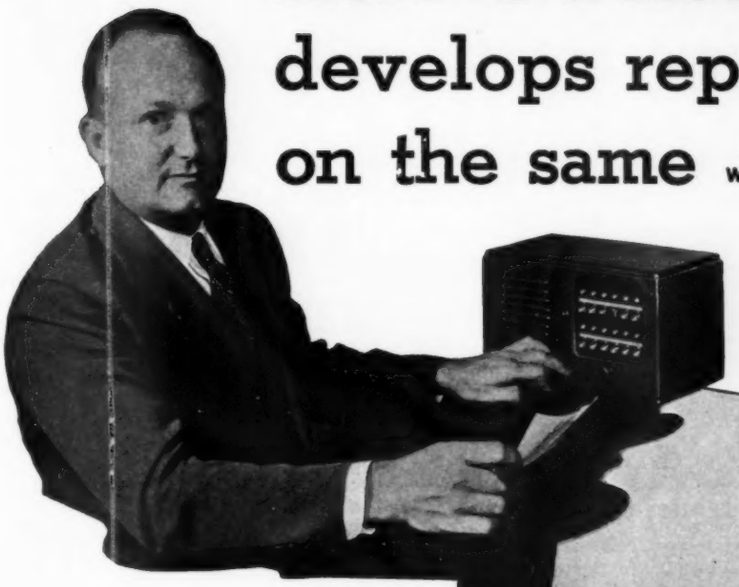
L. O. Fryer, formerly sales manager at San Francisco, becomes a member of the general sales department, reporting to E. A. Hawkins.

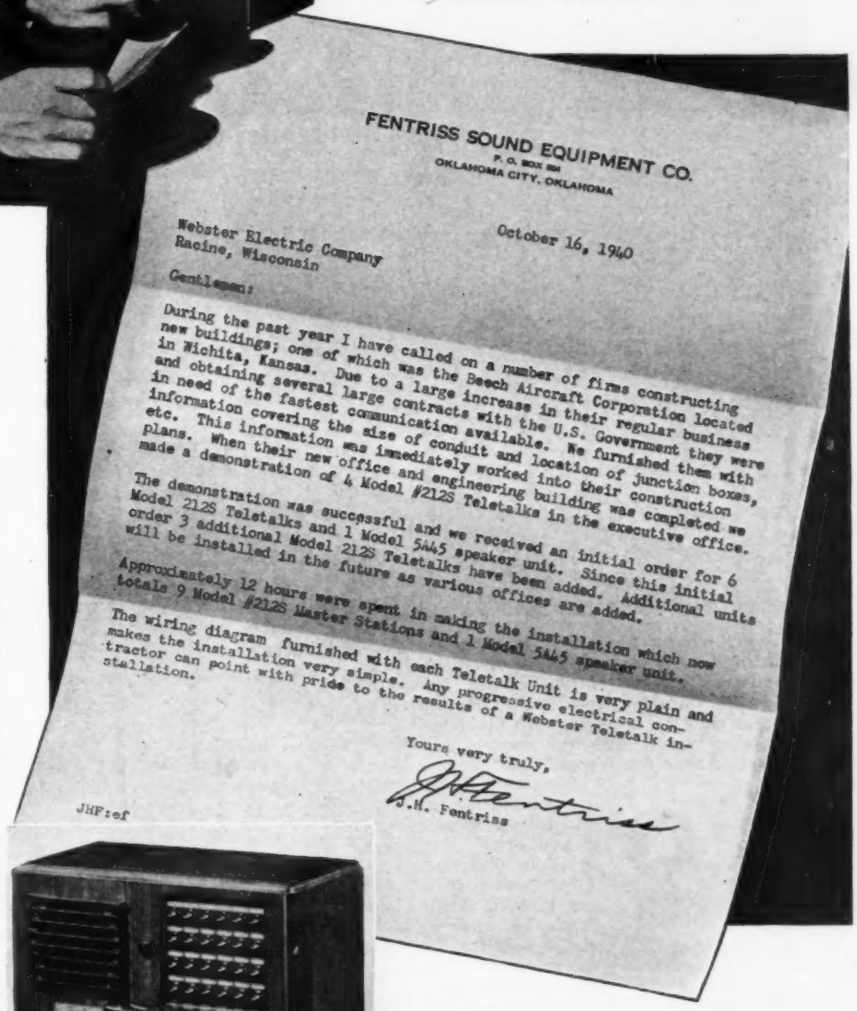
J. R. Ernest, sales statistician, left the general sales department to become assistant to the general service manager.

Frank J. Saffer has been made manager of the Omaha Branch, replacing A. D. Barber who has retired.

E. C. Fox, formerly city salesman, has been appointed sales manager of the Miami branch office.

Here is a Retailer who develops repeat business on the same WEBSTER ELECTRIC Teletalk Amplified Intercommunication installation!





FENTRISS SOUND EQUIPMENT CO.
P. O. BOX 594
OKLAHOMA CITY, OKLAHOMA

October 16, 1940

Webster Electric Company
Racine, Wisconsin

Gentlemen:

During the past year I have called on a number of firms constructing new buildings; one of which was the Beech Aircraft Corporation located in Wichita, Kansas. Due to a large increase in their regular business and obtaining several large contracts with the U.S. Government they were in need of the fastest communication available. We furnished them with information covering the size of conduit and location of junction boxes, etc. This information was immediately worked into their construction plans. When their new office and engineering building was completed we made a demonstration of 4 Model #212S Teletalks in the executive office.

The demonstration was successful and we received an initial order for 6 Model 212S Teletalks and 1 Model 5445 speaker unit. Since this initial order 3 additional Model 212S Teletalks have been added. Additional units will be installed in the future as various offices are added.

Approximately 12 hours were spent in making the installation which now totals 9 Model #212S Master Stations and 1 Model 5445 speaker unit.

The wiring diagram furnished with each Teletalk Unit is very plain and makes the installation very simple. Any progressive electrical contractor can point with pride to the results of a Webster Teletalk installation.

Yours very truly,

J.H. Fentriss

JHF:ef

This letter tells how Mr. J. H. Fentriss secured an initial order from Beech Aircraft Corporation, an additional order and plans for still another order now that the Beechcraft plant is being expanded.

Any retailer that passes up the profits to be secured in selling Teletalk is just plain "missing the boat."

What Fentriss is doing *any* alert retailer can do. He demonstrates Teletalk and gets business—then repeat business—and then more business—all from the same customers. And he gets the labor and material sale that goes with the installation. That's really getting profit.

And businessmen want Teletalk because it saves hours, it saves steps, it saves energy—and with time such a vital factor today, these savings are very important.

Any retailer can sell Teletalk. It sells itself. It talks for itself. If you don't believe this try a demonstration in any office or plant. You'll make a sale. That's how Fentriss and lots of other retailers are making profits.

Teletalk is available in a wide range of prices and models—for little business or big business.

If your jobber does not handle Teletalk write us.

Left: MODEL 224 TELETALK
Capacity up to 24 stations. Teletalk models for every intercommunication requirement: from simple five station systems to deluxe models with "busy signal," confidential handsets and other features.

Licensed by Electrical Research Products, Inc., under U. S. Patents of American Telephone and Telegraph Company and Western Electric Company, Incorporated

WEBSTER ELECTRIC COMPANY, Racine, Wis., U. S. A. Est. 1909. Exp. Dept.: 100 Varick St., N. Y. C. Cable Address: "ARLAB" New York City

Webster Electric

"Where Quality is a Responsibility and Fair Dealing an Obligation"

MANUFACTURERS OF TELETALK INTERCOMMUNICATION AND PAGING SYSTEMS • POWER AMPLIFIERS AND SOUND DISTRIBUTION EQUIPMENT • RADIO PHONOGRAPH PICKUPS • IGNITION TRANSFORMERS AND FUEL UNITS FOR OIL BURNERS

In the News

[FROM PAGE 70]

A new office and warehouse has been opened in Portland, Maine and Chattanooga, Tenn. T. A. Huston, sales manager, will be in charge of the Portland branch and W. J. Dowd, service supervisor, will be his assistant. The new branch is located at 244 Forest Ave.

C. C. McGraw, sales manager, will be in charge of the Chattanooga branch. He will have as his assistant J. P. Majors, service supervisor. The address is 1222 Carter Street.

•

Westinghouse Changes

Westinghouse Electric & Manufacturing Co. announce the following appointments—

Charles H. Guy, Northwestern district merchandising manager for the Westinghouse Merchandising Division, has been appointed assistant sales manager of the Division.

The Division has two other assistant sales managers—Reese Mills, at the Mansfield headquarters and J. F. O'Donnell, San Francisco.

S. M. Davison, merchandising division manager of the Southeastern district, with headquarters in Atlanta, succeeds Mr. Guy as Northwestern district merchandising manager, with headquarters in Chicago. William B. Creech, former sales development manager in the Southeastern district, is named merchandising manager of that district.

C. B. Ketcham has been promoted to manager of the Cincinnati, Ohio office and C. G. Jewett becomes manager of the Columbus, Ohio office.

Leon R. Ludwig has been named manager of the newly combined division of circuit breaker and protective devices engineering, at East Pittsburgh.

L. G. Atkinson has been appointed manager of a new section of the circuit breaker sales department, East Pittsburgh.

•

Cutler-Hammer, Inc. has opened a new factory, warehouse and sales office at 711 Potrero Ave., San Francisco, California. Pacific Coast sales headquarters will also be located in the new building. F. H. Oberschmidt, manager of the San Francisco office, supervises the Seattle and Portland sales offices as well.

•

Watco Engineering, Inc. has moved to a new factory location at 12435 Euclid Ave., Cleveland, Ohio. The old location at Carnegie and 40th Street has been retained as a sales and display office but the general offices have been moved to 12435 Euclid Ave.

HYGRADE MIRALUMES MAKE SELLING FLUORESCENT SAFER, FASTER & MORE PROFITABLE!

No so-called "cheap" Fluorescent fixture can deliver the quality, engineering and profit-building dependability of Hygrade's completely guaranteed fixtures..MIRALUMES!

YOUR *reputation* hangs in the balance—and with it your *future income*—every time you sell a Fluorescent fixture.

That's why it pays to do business on a QUALITY basis—to sell HYGRADE MIRALUMES *exclusively!*

It's true that MIRALUMES may cost slightly more in the beginning, but the important point is—*they cost less in the end!*

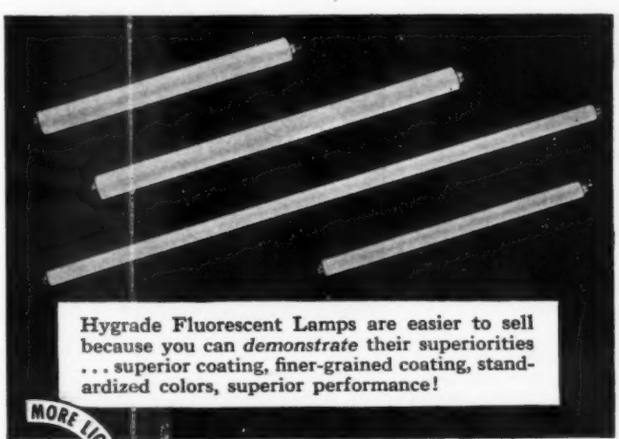
Because (1) MIRALUMES are *quality-manufactured* to give *more dependable* service; and (2), MIRALUMES provide Fluorescent that's sensationally *superior!* (See reasons in box below.)

So the question *isn't*: can your customer afford to buy HYGRADE MIRALUMES? The question is: can *you* afford to let him buy *anything else?*

FOR COMMERCIAL USE—MIRALUME HF-201:
200-watt unit; 4 40-watt tubes; approximate length, 50".

INDUSTRIAL MIRALUME F-100: *100 watts; 2 40-watt tubes; approx. length, 54". No nuts or bolts in reflector surface.*

SHOWN ABOVE are two of many MIRALUMES available. The *only* Fluorescent Lighting Units made *complete*—lamps, fixtures, starters—under *one roof!* Designed, engineered, built, sold complete and *guaranteed* by HYGRADE! Supplied wired and ready to install, or unwired, if desired. Corrected for power factor and stroboscopic effect. Starters easily accessible. Underwriters Laboratory approved. Eligible for FHA financing.



Hygrade Fluorescent Lamps are easier to sell because you can *demonstrate* their superiorities . . . superior coating, finer-grained coating, standardized colors, superior performance!

NOTE! Amazingly superior lighting results are obtained in Hygrade Fluorescent Lamps by tuning the electric discharge to concentrate its ultra violet energy at the precise 2537 Angstrom Unit wave-length most effective in causing the porous film (Hygrade patent 2,096,693) to generate a revolutionary new kind of light. The development of the electrical discharge used in this extraordinary new type of lighting resulted in patents 2,126,787 and 2,201,817, now controlled in this field by Hygrade.

Hygrade Miralumes incorporate the additional advantages of the high power factor, low stroboscopic circuit described in Hygrade patent 2,195,114 and the quick, trouble-free starting described in Hygrade patent 2,195,115. Practical design features that meet the specific needs of industrial and commercial light users are described in Hygrade patents D-120,563, D-122, 145, D-122,236 and D-122,903.

WRITE TODAY for free catalogue, with complete facts on Hygrade Fluorescent MIRALUMES and LAMPS. Address: Dep't EC12, Hygrade Sylvania Corp., Ipswich, Mass.

MORE LIGHT — Hygrade — FULL LIFE — LOW COST

Look for the name HYGRADE on every Fluorescent Lamp and fixture you buy. It is your guarantee of superior quality.

Fluorescent at its Finest—

Lamps Hygrade Miralumes

Hygrade Sylvania Corp., Est. 1901. Makers of Hygrade Incandescent Lamps and Sylvania Radio Tubes

In the News

[FROM PAGE 72]

The Perfex Corporation of Milwaukee, Wis. has moved its New York Office from 90 West Street to 370 Lexington Avenue. George D. Kingsland, who recently became associated with the Perfex Corporation as vice-president in charge of its Eastern Sales Division, will make the New York office his headquarters.

•

Locke Insulator Corporation, Baltimore, Md. announces the appointment of H. L. Williamson as sales promotion manager. He was formerly assistant manager of cable sales for the General Electric Co.

•

Spang Chalfant, Inc., has appointed Harry G. Morrow as manager of sales for conduit and standard pipe, with headquarters in the Grant Building, Pittsburgh, Pa. Mr. Morrow was formerly vice-president and general manager of sales, Central Tube Company.

•

Cutler-Hammer, Inc. of Milwaukee has transferred W. T. Roundy to the Atlanta office. Mr. Roundy has been assigned to the State of Florida and will make his headquarters at Orlando.

•

General Electric Supply Corp., Bridgeport, Conn. announces the appointments of Charles R. Pritchard and Ralph J. Brown as vice presidents.

•

Anderson & Sons who were formerly located in Springfield, Mass. have recently moved to new headquarters at Westfield, Mass.

•

The Wakefield Brass Company has announced the completion of an expansion program doubling the size of its plant in Vermilion, Ohio.

•

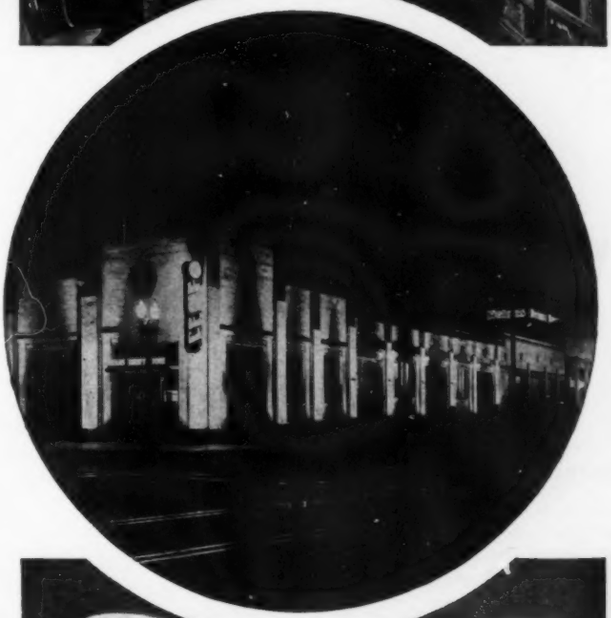
Automatic Electric Manufacturing Co. of Mankato, Minn. has moved into its new office and factory building at 10 State Street.

•

Ward Leonard Electric Co. has opened a new branch office in Rochester, N. Y. It is located in the Lincoln Alliance Bank Building, 183 Main Street East, and will be managed by J. K. Savage, sales engineer.

FOR EVERY *Better Light-Better Sight* PROGRAM

ALZAK
*REG. T. M., ALUMINUM COMPANY OF AMERICA
ALUMINUM
REFLECTORS



Reflecting surfaces that meet the requirements of every lighting job; you can get them with Alzak Aluminum Reflectors, with diffuse or specular surfaces, and combinations of the two. There are no limitations on reflector shapes.

Alzak Reflectors give you the most in lighting efficiency. A lasting, high reflectivity is obtained by a special electrolytic treatment of Aluminum sheet. The smooth, oxide coating of glass-like hardness will not chip and doesn't scratch easily. Cleaning is no problem; simply wash with soap and water.

Some Alzak Reflectors are intended for indoor use. Others withstand out-of-door exposure and the corrosive conditions encountered in certain industrial processes. Whatever your use, be certain that you obtain the right Alzak finish for each job.

We do not manufacture reflectors. Manufacturers who are licensed under Aluminum Company of America patents can advise you and supply your needs.

ALCOA ALUMINUM

You can identify a genuine Alzak Reflector by a label affixed to it by the manufacturer. This lists the patents protecting the processes that assure uniform, high quality workmanship. Look for that label when you are buying reflectors.

ALUMINUM COMPANY OF AMERICA
1946 GULF BUILDING • PITTSBURGH, PA.

EQUIPMENT News

Cable Terminal

The "Streamlined" cable terminal, type SNA-H, is designed for easy taping of connector and helps insure moisture-proof seal to insulation. A recess at cable entrance permits end of cable insulation to be inserted into connector and protects cut end of insulation. Cap is clamped on conductor by hollow head cap screws. Also made with hexagon head cap screws set in recesses in cap. Can be made for all cable sizes up to 3000 MCM. Burndy Engineering Co., Inc., 459 East 133d Street, New York, N. Y.

BURNDY CABLE TERMINAL

■

Switches

New additions to this line of rain-tight outdoor switches include "Renu-Fuse" pull cover type construction. Rating is 60 amperes, 3 poles, solid neutral, 125–250-volts, a.c. Made with range and four lighting circuits and water-heater terminals. Also with 2 and 4 lighting circuits. Cabinet with top hinged door, built of rust-resisting steel, with hub in top, and locking or sealing device at the bottom. Equipped with pressure wire connectors. Wadsworth Electric Mfg. Co., Inc., Covington, Ky.

WADSWORTH SWITCH

WESTINGHOUSE FLOODLIGHTING UNIT

Lighting Unit

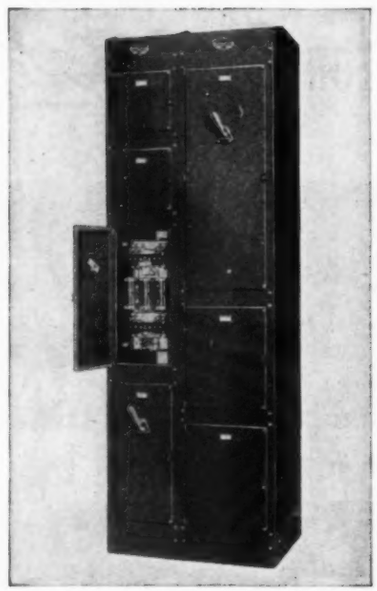
"Tufflite Concentrator" is a floodlighting unit developed to withstand vibration and resist deterioration from corrosive atmospheric vapors. Uses either 300- or 500-watt PS-40 mazda lamp. Recommended for use in railroad roundhouses, munition plants, electroplating plants, breweries and around soaking pits, pickling vats and impregnating tanks. Unit consists of copper housing, inner Alzak aluminum reflector, bronze socket housing assembly. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

■

ELECTRO DOME-TURBO EXHAUST

Ventilating Equipment

The Dome-Turbo exhaust system is mechanical ventilation for kitchen, bath and amusement room. It is convertible so that it may be installed either in ceiling, over kitchen range, or in any outside wall. Has automatic draft-proof shutters. Unit includes motor, blower, blower housing, weather hood, shutters and aluminum grille. For use in old as well as new homes under construction. Electro Specialty Co., 2936 Fourth Avenue South, Minneapolis, Minn.



CUTLER-HAMMER UNITROL

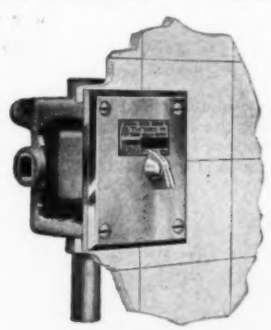
Motor Control Centers

Unitrol sectionalized motor control cabinet permits all needed types of control devices to be organized in locker-like motor control centers. Standard motor control units are mounted in standardized cubicle sections. Made in 32 sizes; eight widths, four heights, one depth—for mounting any desired combination of units. Standard units accommodate controllers, disconnect switches, circuit breakers, and accessories as required. Control units can be mounted in both front and rear of section. Units are assembled either with all wiring buses, supports, terminals and interconnections made, or with provisions for wiring it on job. Cutler-Hammer, Inc., Milwaukee, Wis.

■

Explosion-Proof Switch

The "ESH" series of explosion-proof sealed hospital switches is designed for use in hospital operating rooms. Switching device is sealed with wire leads furnished for connection purposes. Splices are made in Unilet body making complete assembly an explosion-proof unit without use of sealing Unilets. Available in one-, two- or three-gang. Appleton Electric Co., 1701 Wellington Ave., Chicago, Ill.

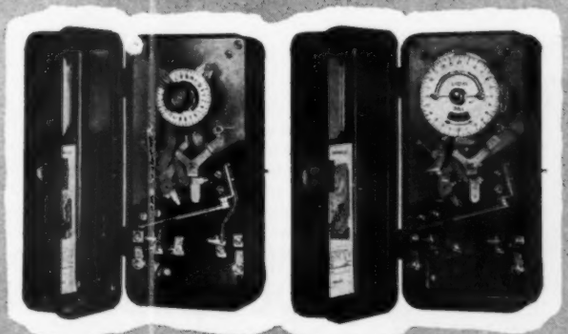


APPLETON SWITCH

For years electric signs have been the proving ground for Sangamo

TIME-SWITCHES

. . THAT'S WHY YOU CAN EXPECT THEM TO PERFORM DEPENDABLY AND ACCURATELY ON YOUR JOBS



Form KA for installations where no variations are required from a regular daily sequence.

Form KAZ. The astronomic dial changes "on" and "off" operations in accordance with suntime.

ELECTRIC spectaculars are a real "proving ground" for Sangamo Time-Switches. Punctual and dependable performance is all-important. Heavier loads, too, test the ampere rating of the time-switch. Because they can stand up under the severest grind, Sangamo Time-Switches are preferred by leading sign manufacturers. Chances are that operating conditions on your average time-switch installation are nowhere's near as severe—that's why a Sangamo Time-Switch can be expected to give you the kind of satisfactory, service-free performance you, undoubtedly, desire.

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

EQUIPMENT *News*

[FROM PAGE 76]

Multi-Breaker

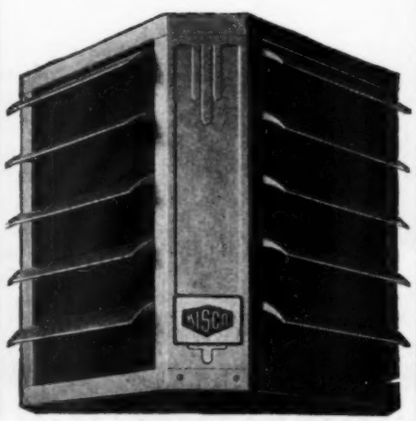
These Type M multi-breakers have been designed for use on 3-phase 4-wire solid neutral 120/208-volts a.c. systems. Three pole breakers with neutrals are used for this type of service. Breakers are common trip. Also trip-free and cannot be held closed on short circuit or overload. Indicating handle shows whether breaker is "On", "Off" or "Tripped". Capacities range from 15 to 100 amp. Furnished for either flush or surface mounting. Square D Company, 6060 Rivard Street, Detroit, Mich.

SQUARE D TYPE M MULTI-BREAKERS

■

Heat Recirculator

With the Kisco V-type "Q-T" heat recirculator, two streams of air provides a wide distribution of heat. Designed for installation in large spaces, such as warehouses, garages, auditoriums, factories, stores and offices. Some of the construction features are two semi-steel headers; copper V-Tubes; compression fittings; free expansion; suspension mountings and streamlined louvers. Kisco Company, Inc., 39th & Chouteau Sts., St. Louis, Mo.



KISCO HEAT RECIRCULATOR

EQUIPMENT News

[FROM PAGE 78]

Welder

A new line of 500-ampere a.c. arc welders with new electrical design which incorporates power-factor correction. Smaller primary cable, line switches and fuses can be used, making possible addition of more welders to existing feeders without causing overload. Other features are finger-tip adjustment; large current indicator; protected output terminals; fan-forced ventilation. Welder is four feet in height, 21-inches in diameter. General Electric Company, Schenectady, N. Y.

G-E WELDER

■

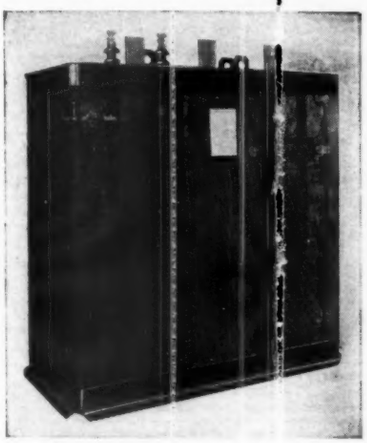
Motor Starters

These magnetic motor starters are designed for across-the-line starting of single and polyphase squirrel cage induction motors, and as primary control for wound rotor induction motors. Have three-point ball-bearing suspension of movable electro-magnet. Magnet operates vertically and cannot close accidentally by vibration or shock. Other features include double break rounded silver-to-silver contacts; layer wound magnet coils with paper section construction; "E" shaped magnet; easily removed contacts and magnet coils; ample wiring space and knockouts. May be furnished for remote control, local control or with transfer switch in cover. Colt's Patent Fire Arms Mfg. Co., Electrical Division, Hartford, Conn.

COLT MAGNETIC MOTOR STARTER

Transformers

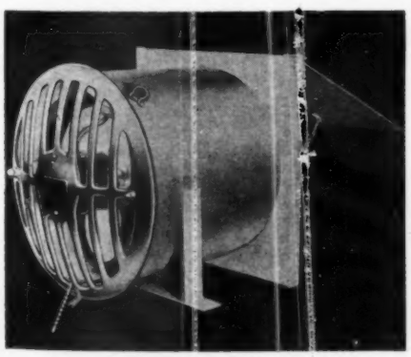
Type ASL air-cooled transformers are designed for installations in buildings where safety is essential. They have 60 cycle ratings ranging from 150 to 500 kva. incl. for single phase and 150 to 1000 kva incl. for 3 phase, voltages 13,200-volts and below. May be located near load center, permitting short secondary cable runs. Housing is constructed of expanded metal finished in black baked-on moisture-proof enamel. Primary and secondary coils are separated by liberal air spaces through which a stream of air constantly circulates. Windings are designed for a 75-deg. C temperature rise under continuous full load operation. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.



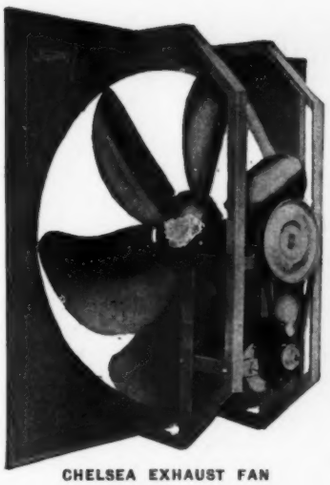
WESTINGHOUSE TRANSFORMERS

Ventilator

This wall-type ventilator is called "Kitch-N-Ventor". Available in 8-in. and 10-in. fan sizes. Capacities 500 and 700 C.F.M. Oval grille is of polished aluminum. The 4-pole motor requires 50-watts, 110-volts, 60 cycle. Nickeled chain operates automatic motor switch and outer door. It is weatherstripped with felt. Universal Blower Co., Birmingham, Mich.



UNIVERSAL KITCH-N-VENTOR



CHELSEA EXHAUST FAN

Fans

These belt driven exhaust industrial fans are for use in factories, mills, shops, schools, churches, hotels and hospitals. Available in ¼ hp. to 1½ hp. motors. Some of the features are—protruding orifice; certified air ratings; ball bearing motors; all steel construction and heavy duty die stamped blade. Sizes are 12-in. to 72-in. with or without penthouse. Chelsea Fan & Blower Co., Inc., 370 West 15th St., New York, N. Y.

HICKOK POWER ANALYZER

Instrument

This new universal power analyzer measures polyphase and single phase volts, amperes and watts. Can be used on single phase 2 wire, single phase 3 wire, 2 phase 3 wire, and 3 phase 3 wire circuits. Meter is standard Hickok Model 49 square, two element, polyphase wattmeter. Voltage can be measured across any two wires on three wire circuit. Ranges include voltage to 650-volts, amperes to 52 amps. and watts to 20,000 watts. One transformer is required for single phase two wire circuits. Two transformers are needed for all three wire circuits. Hickok Electrical Instrument Co., Cleveland, Ohio.

EQUIPMENT News

[FROM PAGE 81]

Recorders

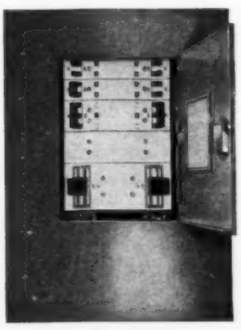
The Type CF line of inkless recorders has been extended to include d.c. instruments, available as voltmeters, ammeters, millivoltmeters, milliammeters and microammeters in ratings down to 125 microamperes. Because of inkless operation, they are recommended for general testing purposes and for use on moving vehicles. It is portable, may be wall or pole mounted, and is suitable for indoor or outdoor applications. It may be operated at temperatures ranging from —10° F to 120° F. General Electric Co., Schenectady, N. Y.

G-E RECORDER

■

Multi-Breaker Panel

A new line of "MH" multi-breaker power panels have been developed. They are dead front with 15–100 ampere capacity common trip branch breakers. Single phase and 3-phase, 115–230-volt a.c., suitable for use on ungrounded systems. Boxes are 5¾-in. deep. Multi-breaker units are interchangeable and can be arranged in many combinations. Trumbull Electric Mfg. Co., Plainville, Conn.



TRUMBULL MULTI-BREAKER PANEL

We Start With Horse Sense

[FROM PAGE 15]

observed. He begins literally at the bottom: sweeping the floor, washing motors, assisting in every possible way, learning through experience and contact the names and uses of parts and devices—learning to "speak the language" of the motor repair shop.

The lad doesn't just wash down a frame as a disagreeable job. It is given to him with a personality: "Say, Bill, clean up this Westinghouse CCL, will you?" or "Where's that GE KT-964 I gave you this morning?" The older men really get a kick out of watching the education process and many a time I have seen a mechanic line up a few controllers or compensators or magnetic switches and say, "All right, bub, which is the ten-thirty-four and which is the seventy-oh-six?"

The bonus, you see, is a constant stimulus. If the mechanic doesn't help the new man to learn quickly and work better, his own bonus is going to be reduced by the helper's inefficiency! The problem solves itself!

Apprentice Training

When the beginner is thoroughly grounded in the essentials, he advances to stripping, coil winding, testing and so on through the various operations. The time the new employee will spend in each division of the shop depends on his own ability: he is not advanced until he is as perfect as humanly possible on the step he is learning.

When he has wound his first armature, he keeps looking over at the bake oven, watches "his job" when it gets to the assembly bench. He's nervous as a new daddy as it goes to the test bench. The mechanics know how they felt, years back, under the same circumstances. The lad almost cries when the motor won't turn—because it has been plugged into a dead outlet, specially rigged for the occasion. But what a thrill when the "hazing" is over and the trainee sees that he has mastered the job!

The trainee is not allowed to relax interest. The mechanics feel that if the new man does not ask questions continually—and that applies just as much in his third or fourth year as in his third or fourth week—he must be slipping. And so they jack up the apprentice by saying, "What's the matter? Do you know all about this already? You're not asking me questions any more!"

Finally the man is ready to go out on jobs. He accompanies a mechanic, watches, questions, assists. It may be two, three or four years from the time he has started to work for us, but he's still "in training." And now the mechanics really get tough if the apprentice's attention wanders! "Listen, you——," the mechanic will exclaim. "You're getting paid to watch me do this! Now you watch, and see if you can learn anything!" When it is felt that the man has sufficient training and self-confidence, at long last he is sent out on service calls by himself. Then he's a full-fledged mechanic!

The system pays out. Of the five mechanics in our shop today, two are men whom we have trained right from the bottom. One is in his tenth year with us, another in his sixth; there's a helper who is completing his third year and it's about time to find a new lad.

These men are undoubtedly far more competently trained—particularly in our methods—than they might have been by any other means. And the company has benefitted, too, by having a constant supply of men of the desired caliber who cannot usually be found on the labor market.

One thing more. The spirit of co-operation is not entirely from the men to the firm—it works both ways. As we find articles of particular interest in trade papers each month, we call them to the attention of the men, invite them to read the magazine so that they may be thoroughly posted on industry progress. They go through the advertising pages, and if any employee wants to have information on a new product or a new application, we eagerly send for it.

When manufacturer's literature comes in the mail that is of special interest, it is likewise brought to the attention of employees, and additional copies of bulletins and leaflets are sent for so that every man may have a chance to study the data. They must know why as well as how, and we help them to the utmost. Such attention to personnel problems translates into repair shop profit dollars just as surely as investments in modern equipment!

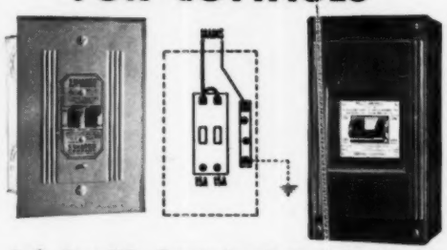
GLIMPSES OF OURSELVES

Advertiser's Index

*See 1939–1940 Buyers' Reference number of Electrical Contracting for additional information on these companies and their products.

THERE'S A SQUARE D MULTI-BREAKER FOR HOMES OF EVERY SIZE

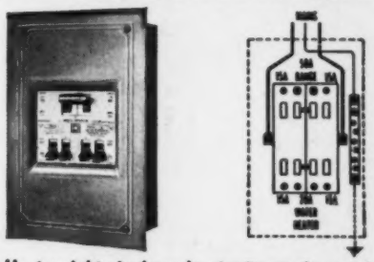
FOR COTTAGES



Left · Type MO—Two single pole circuits, 15, 20 or 25 amperes; no main switch or breaker required. List price $2.15 to $2.80.

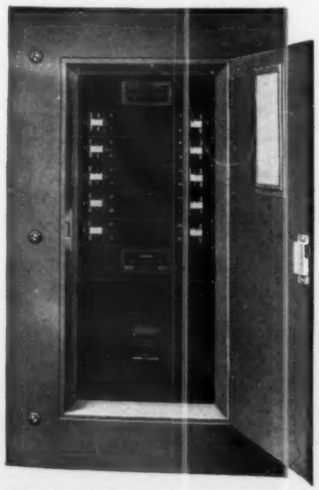
Right · Type M1—Similar to Type MO but with capacity up to 50 amperes. List price $5.00 to $6.30.

FOR AVERAGE HOMES



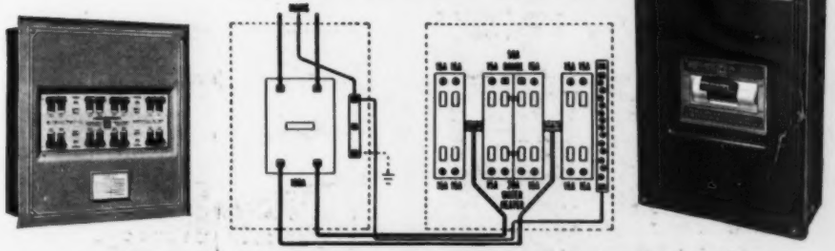
Type MB—Up to eight single pole circuits or the equivalent in single and double pole circuits; 15 to 50 amperes capacity. No main switch or breaker required when there are six or less circuits. List price, $6.00 to $13.80.

FOR APARTMENTS, SCHOOLS, STORES, COMMERCIAL BUILDINGS



Multi-breakeR Lighting Panelboards in all combinations up to 42 breaker poles.

FOR LARGE HOMES



Type MB Load Center—Up to sixteen single pole circuits or the equivalent in single or double pole circuits. 15 to 50 amperes capacity. List price $27 to $37. Often used with Type M2, 100 ampere main breaker (at right). List price, $15 to $18.50.

CIRCUIT BREAKER PROTECTION AND CONVENIENCE AT LOW COST!

Square D Multi-breakeRs cost very little more than the switch and fuse equipment they replace—sometimes actually less. Yet look what they enable you to offer the home builder. Circuit breaker protection—branch circuit switching—freedom from the annoyance and expense of replacing fuses. Another important point—the Multi-breakeR creates interest in better wiring, more outlets and more appliances. It leads to bigger, better and more profitable wiring jobs.

If you haven't the complete story of the Multi-breakeR, ask your Square D distributor—or write for Bulletin CA-4000.

CALL IN A SQUARE D MAN

SQUARE D COMPANY

DETROIT - MILWAUKEE - LOS ANGELES

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

Four G-E PUBLICATIONS TO HELP YOU SELL and INSTALL ADEQUATE WIRING

HERE'S HELP FOR YOU!

Here's help for you! Three different factual handbooks—one on adequate industrial wiring; one on adequate residential wiring; and one on adequate farm wiring. Suggestions given in the industrial wiring handbook for modern wiring, apply with equal force to the wiring of commercial buildings.

Here also is a sprightly cartoon-filled booklet for you to give to your house wiring prospects. It will convince them of the importance of adequate wiring.

The handbooks will help you formulate effective sales talks and will serve as guides in the actual design and installation of adequate wiring. Modern wiring practices are outlined which can be adopted in your present jobs. Moreover, in each handbook there is a chapter describing G-E wiring materials—conduit, wire and cable and wiring devices—which will help in selecting materials and in writing material specifications.

ADEQUATE WIRING SERVES AND SAVES

To obtain a copy of any one of these publications, or all of them, see the nearest General Electric Merchandise Distributor or mail the coupon below.

General Electric Company
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Bridgeport, Connecticut

Sirs: Please send me without obligation the following publications:

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( ) G-E Home Wiring Handbook
( ) Farm Wiring Handbook
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